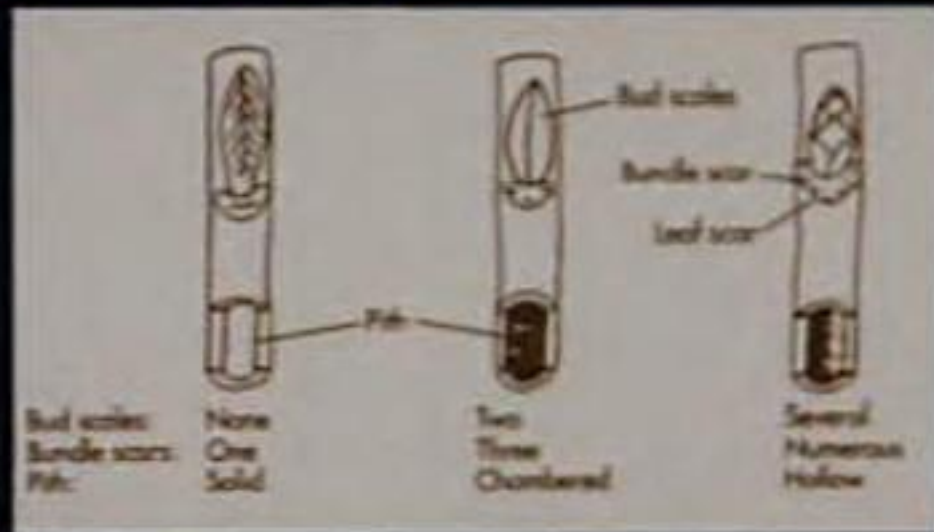
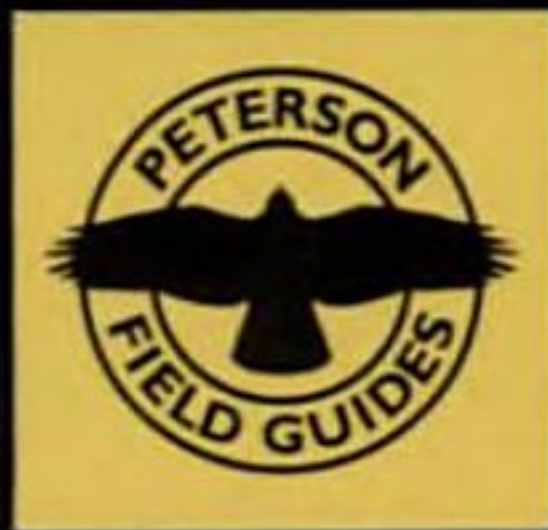


PETERSON FIELD GUIDES®

# Western Trees



George A. Petrides/Olivia Petrides





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A FIELD GUIDE TO  
WESTERN  
TREES





## HOW TO USE THIS BOOK

**PLEASE READ THIS SECTION:** In using field guides, people tend naturally to head straight for the illustrations, either ignoring the introduction and text or simply skimming them. Anyone who seriously wants to identify trees, however, should not overlook this part of the book. The following pages explain the difference between opposite and alternate leaves and between compound and simple leaves. Here, too, are definitions of several terms that reappear in later sections. Even the word *twig* has an essential specific meaning that may be new to you!

### GENERAL ORGANIZATION

The text is divided into six principal sections, beginning with the most easily recognized types:

- I. Trees with needlelike or scalelike leaves
- II. Trees with opposite compound leaves
- III. Trees with opposite simple leaves
- IV. Trees with alternate compound leaves
- V. Trees with alternate simple leaves
- VI. Trees with parallel-veined or padlike leaves (palms, yuccas, cacti)

The six basic leaf types and arrangements are illustrated at the end of this chapter.

Within each principal section, trees are placed in small groups beginning with the most recognizable characteristics (thorns, lobed leaves, toothed leaves, etc.) and ending with species having the fewest obvious distinguishing features. It is a good idea to work from front to back within the book as a whole and within each section.

The comparison charts and other keys, which are explained below under IDENTIFYING UNKNOWN PLANTS, will further



help you identify species. Appendix A provides a comprehensive winter key to all non-evergreen species. A summary of family and other relationships of western trees appears as Appendix B. Meanings of some terms are summarized in the Glossary. A rule on the back cover permits conversion of inches to millimeters. References include works cited and other publications of interest.

## LEAF TYPES AND PATTERNS

When they are in leaf, all woody plants fall into one of the six major categories described above. Some readers may already be familiar with these categories or need only a few minutes' review. Novices, however, should be especially careful to note the differences between simple and compound leaves. One must be especially careful not to misidentify the opposite leaflets of some compound leaves as opposite *simple leaves*.

Plants whose leaves are obviously not needlelike or scalelike are *broad-leaved plants*. Among such plants, a *simple leaf* has only a single blade and is joined by its stalk to a twig or branchlet that is woody. A *compound leaf* has several distinct leaflets attached to a midrib that is not especially woody. It is the stalk of that midrib that is attached to the woody twig. When the leafstalk of either a simple leaf or a complete compound leaf falls or is plucked, a distinct *leaf scar* (Fig. 1) is left behind on the twig or branchlet. That leaf scar usually has a *bud* present above or within it. Tiny *bundle scars* (broken nutrient tubes) also are present as tiny dots within the leaf scar. In contrast to the definite leaf scar and bud on a woody twig, only an indefinite mark and no bud are evident on the midrib when a leaflet is plucked.

Distinguishing between simple leaves and the leaflets of a compound leaf soon becomes second nature to the developing naturalist. At least for a while, however, the novice should always pluck a "leaf" to see whether a leaf scar of definite shape, along with its associated bud and bundle scars, is left behind. This will tend to ensure that a leaflet is not misidentified as a leaf.

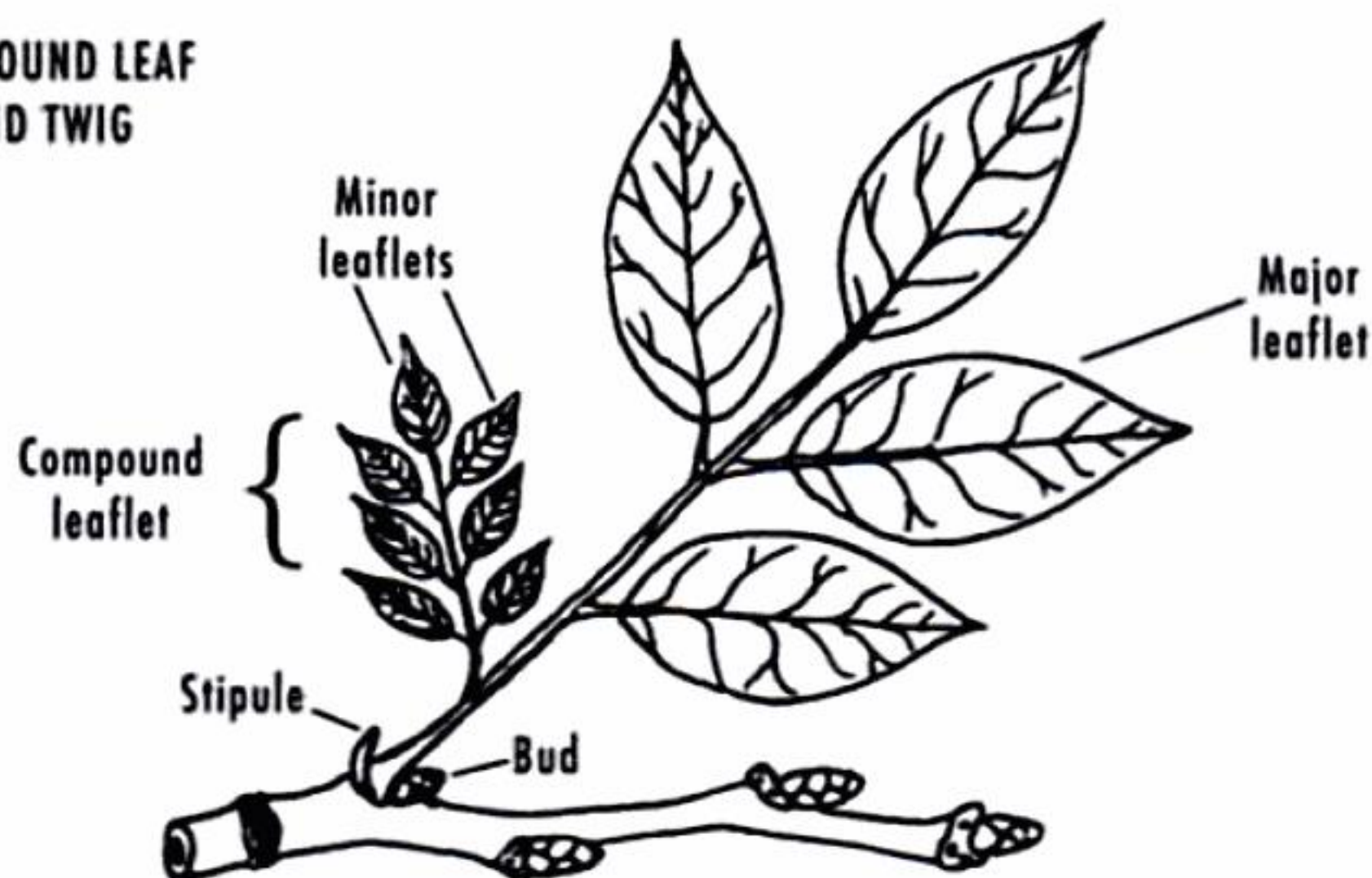
In a relatively few species (Pls. 19, 20, 25), the major leaflets of the compound leaf are themselves divided into minor (sub)leaflets. Such leaves are *twice-compound* and may involve 4 to 800 or more minor leaflets.

Both compound and simple leaves may vary in shape, size, texture, and other characteristics. Despite all variation, however, the two main leaf types of simple and compound are fundamental.

*Opposite leaves* may be either compound or simple. They occur in opposing pairs along the twigs. Whorled leaves, where three or more leaves arise together around the twig, occur only infre-



# COMPOUND LEAF AND TWIG



# SIMPLE LEAF AND TWIG

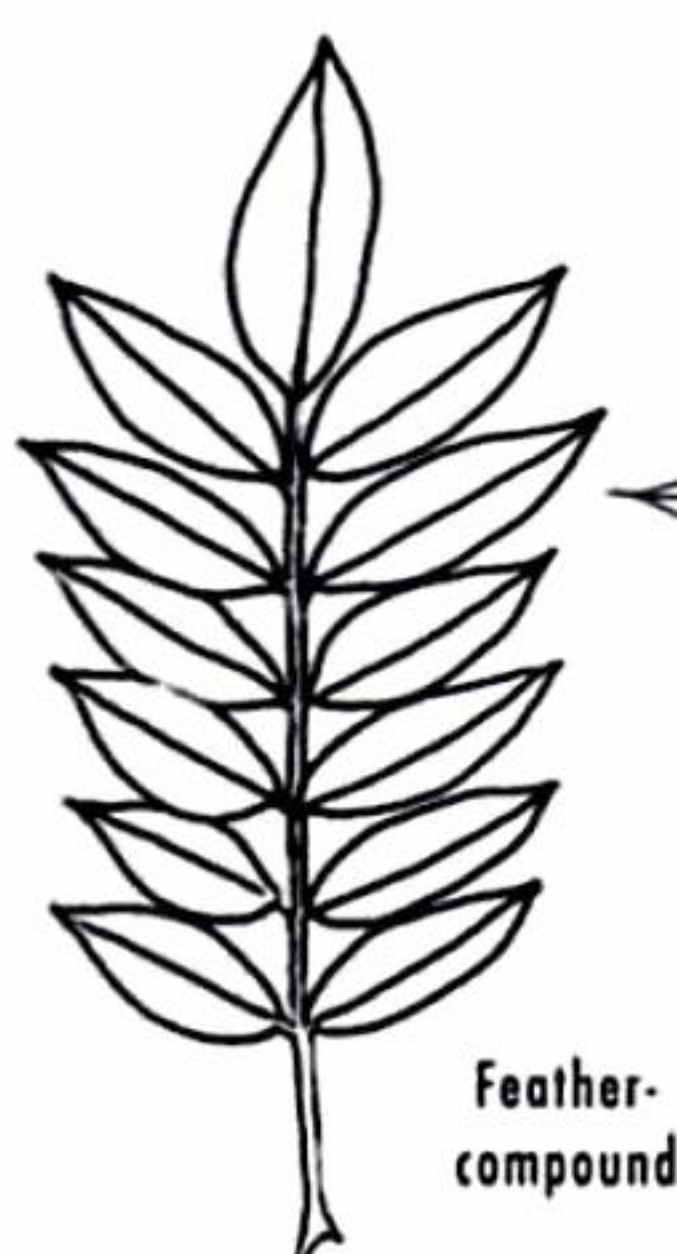
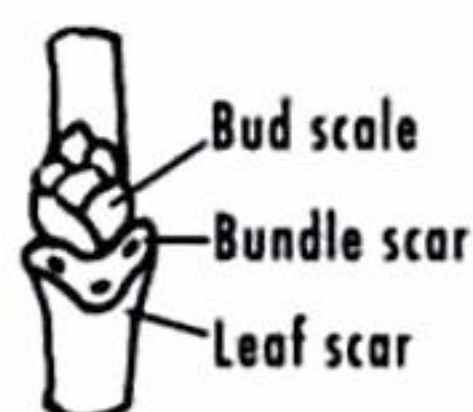
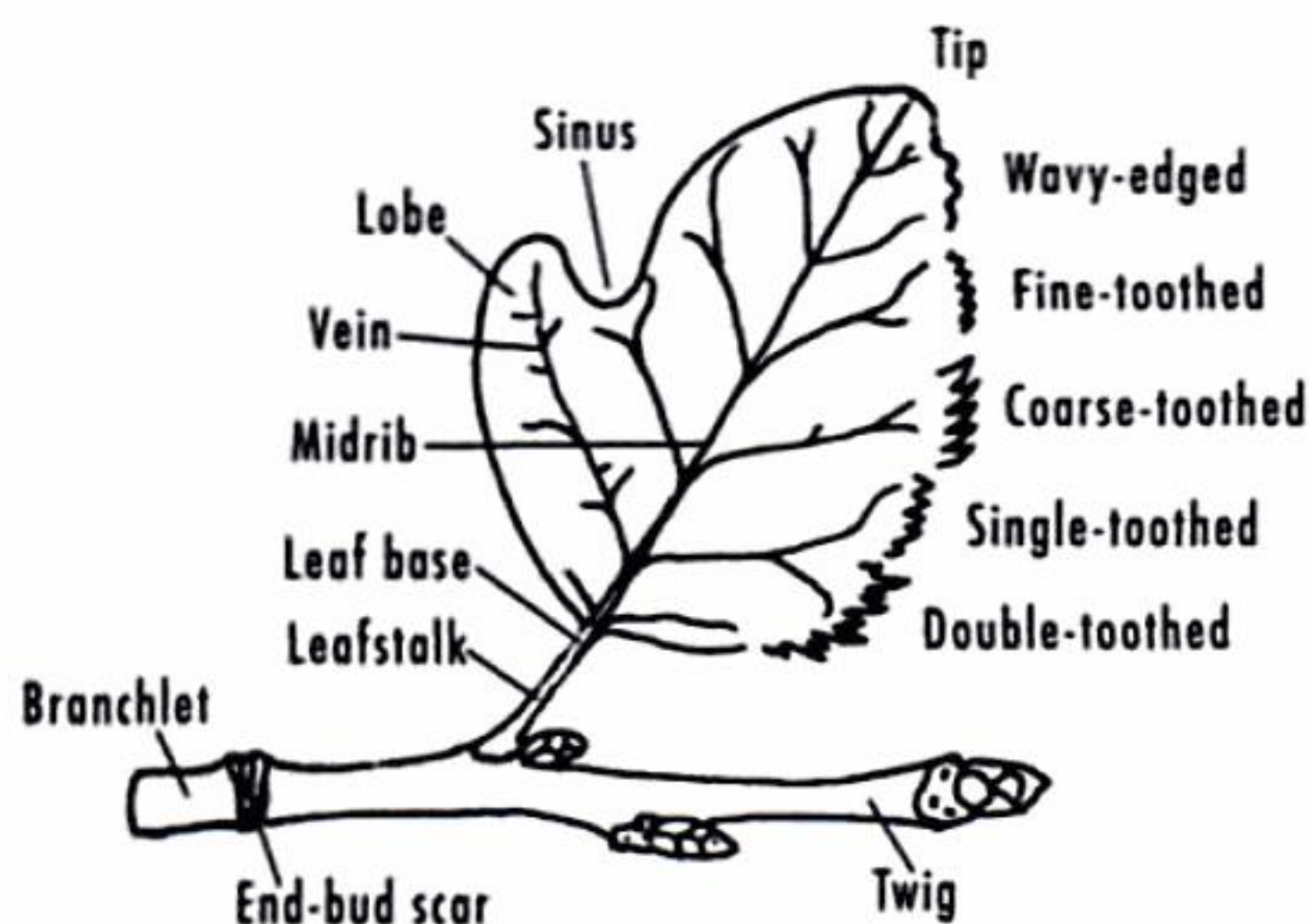


Fig. 1 . Leaf and twig terminology

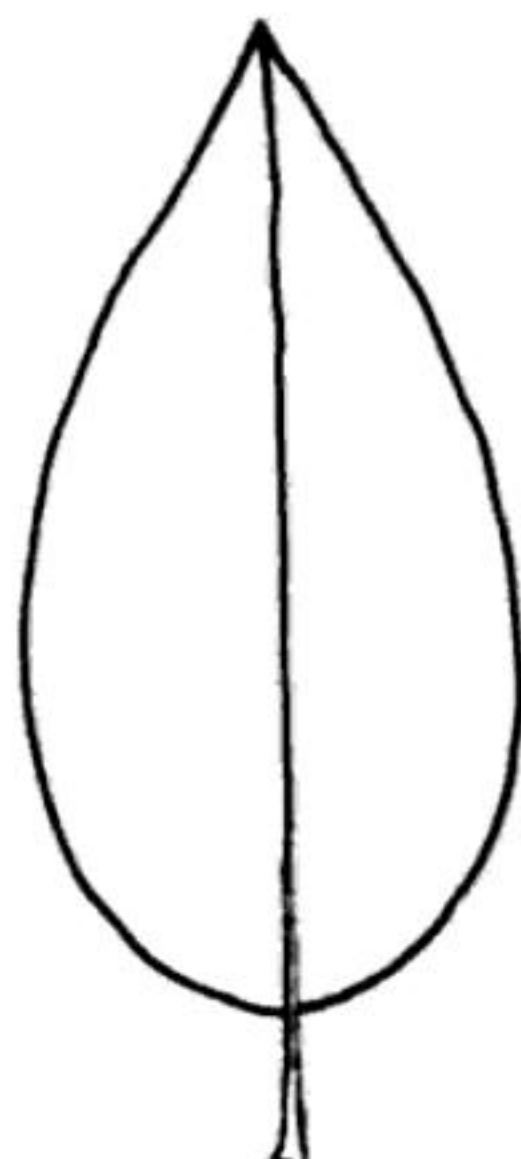




Narrow



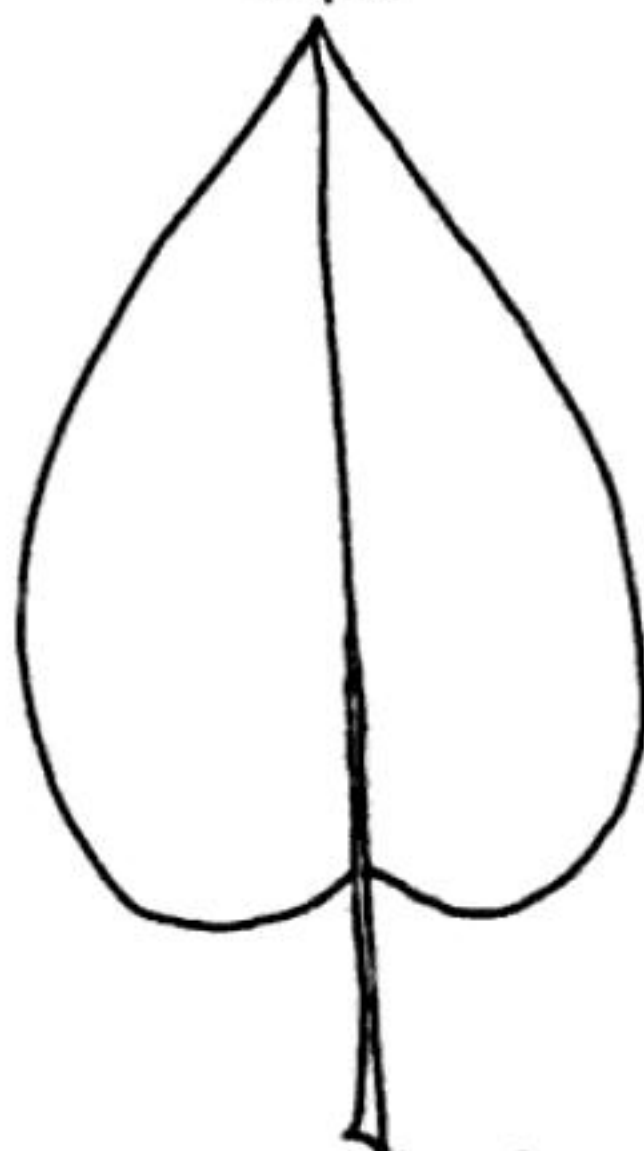
Elliptic



Egg-shaped



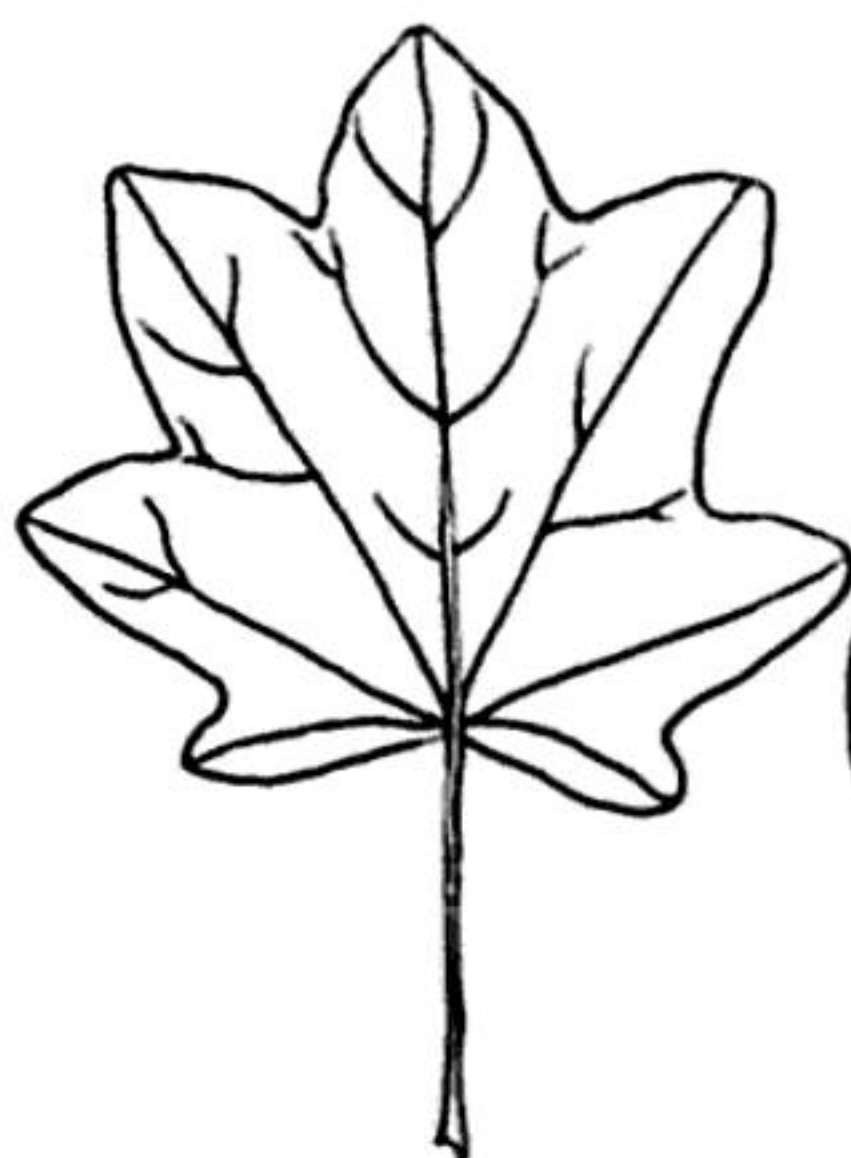
Wedge-shaped



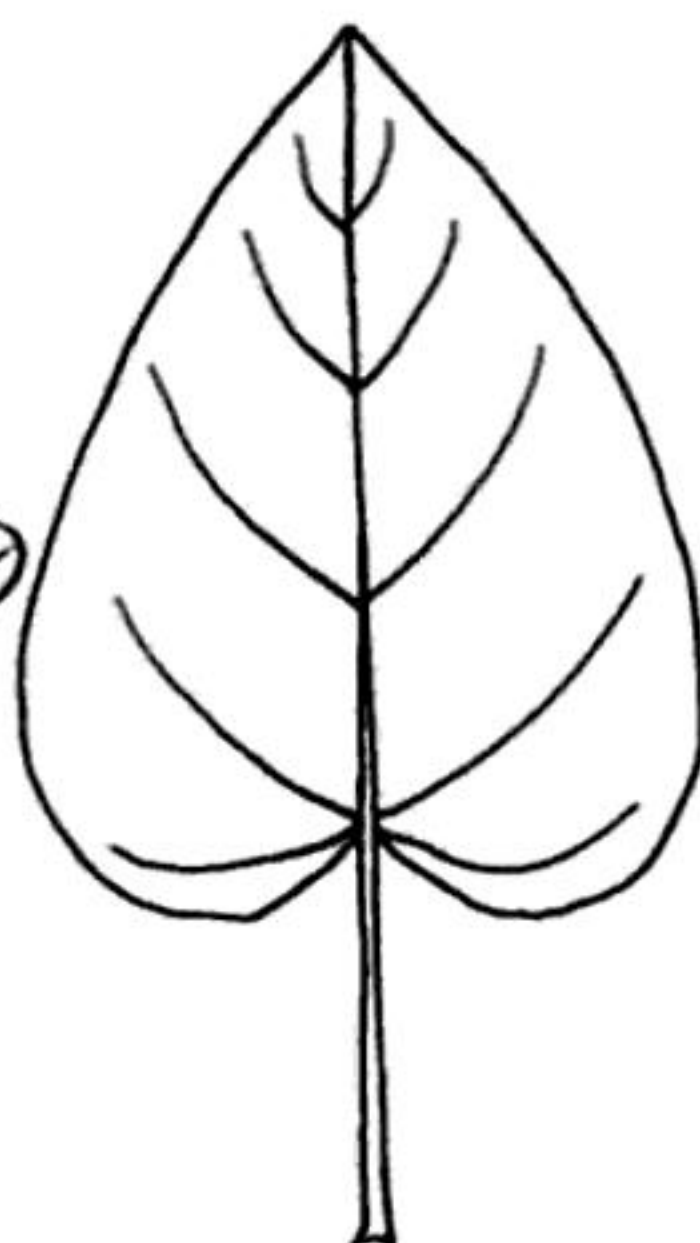
Heart-shaped



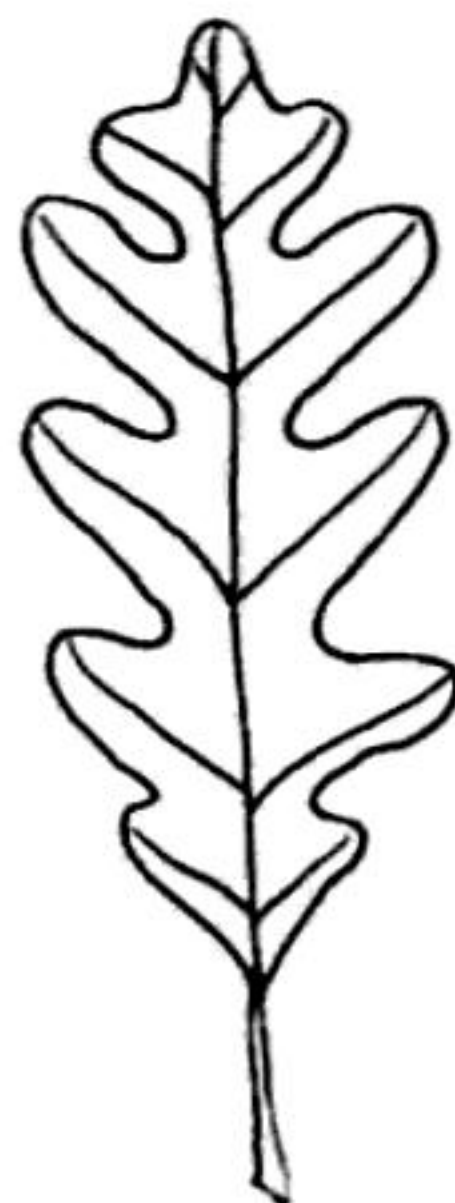
Long-pointed



Fan-lobed



Fan-veined



Feather-lobed

*Fig. 2. Leaf shapes*



quently. The few plants with whorled leaves are included in the opposite-leaved category.

*Alternate leaves* are arranged singly at intervals along the twigs. Just as one must be careful not to confuse opposite leaflets with opposite simple leaves so, in the other direction, some alternate-leaved plants bear *spur branches* on which leaves are densely clustered (see Fig. 3). These can be mistaken for opposite or whorled leaves if one is not careful to select strong-growing specimen twigs for study (see **Identifying Unknown Plants**, p. 8).

Broad-leaved plants are often called *hardwoods* by foresters, in contrast with the needle-bearing *softwoods*.

## TWIG AND BUD TYPES

Twig and bud characteristics are important during winter and other times when trees are leafless. Probably because evergreen trees often predominate there, the characteristics of leafless western trees seem to have been somewhat neglected. Efforts have been made in this book, however, to assemble identification points for trees in leafless as well as in leafy condition.

A *twig* is not just any small division of a branch but the end portion — the part that constitutes the newest growth. The *branchlet* is the previous year's growth and is separated from the twig by a series of encircling *end-bud scars* (Fig. 1). The term branchlet also is applied to any small branch that is not a twig. When they are leafless, *non-evergreen* broad-leaved plants fall into two main groups: (1) those of Sections II and III with leaf scars arranged on the twigs in opposing pairs, or rarely in whorls of three or four, and (2) those of Sections IV and V, with leaf scars arranged singly on the twigs in a more or less scattered pattern (see Fig. 3). It is not always possible to identify with certainty the leaf scars of compound and simple leaves, though those of compound leaves are often larger and have more than three bundle scars.

Subdivisions made within the opposite- and alternate-leaved groups reflect the type of buds, the kind of pith, the number of bundle scars, the presence of milky sap, and other characters. Bud descriptions apply to mature winter buds. The term *chambered pith* is used here to include all types of segmented and transversely divided pith (the spongy core of a twig), including pith that is diaphragmed and partitioned. The main characteristics of twigs and buds are illustrated in Fig. 3.

End buds are designated as true or false (see Fig. 3), but the distinction is not always obvious. Some books mention end buds as present or absent rather than as true or false. In this volume, true end buds and clear sap may be considered to be present



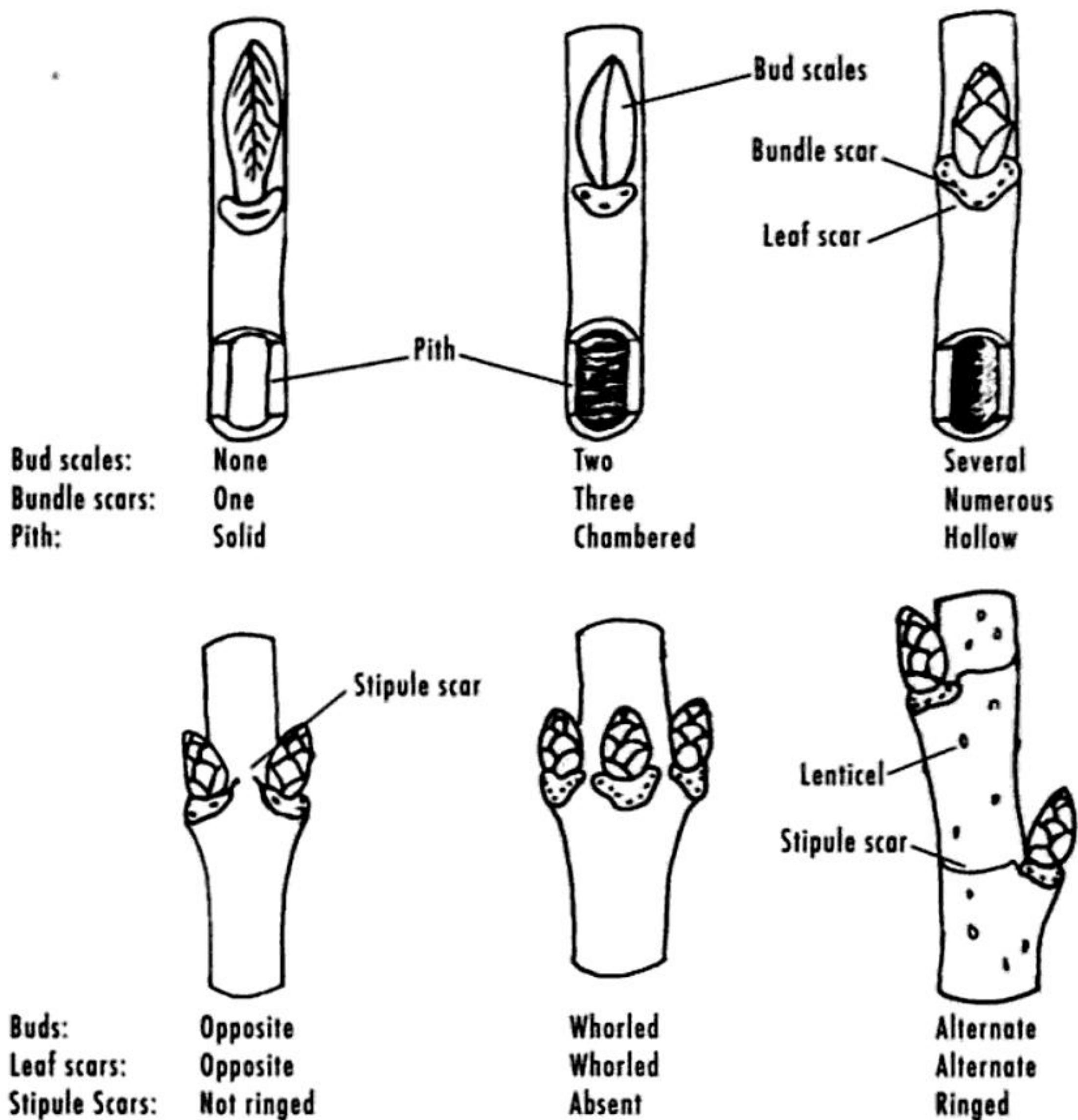
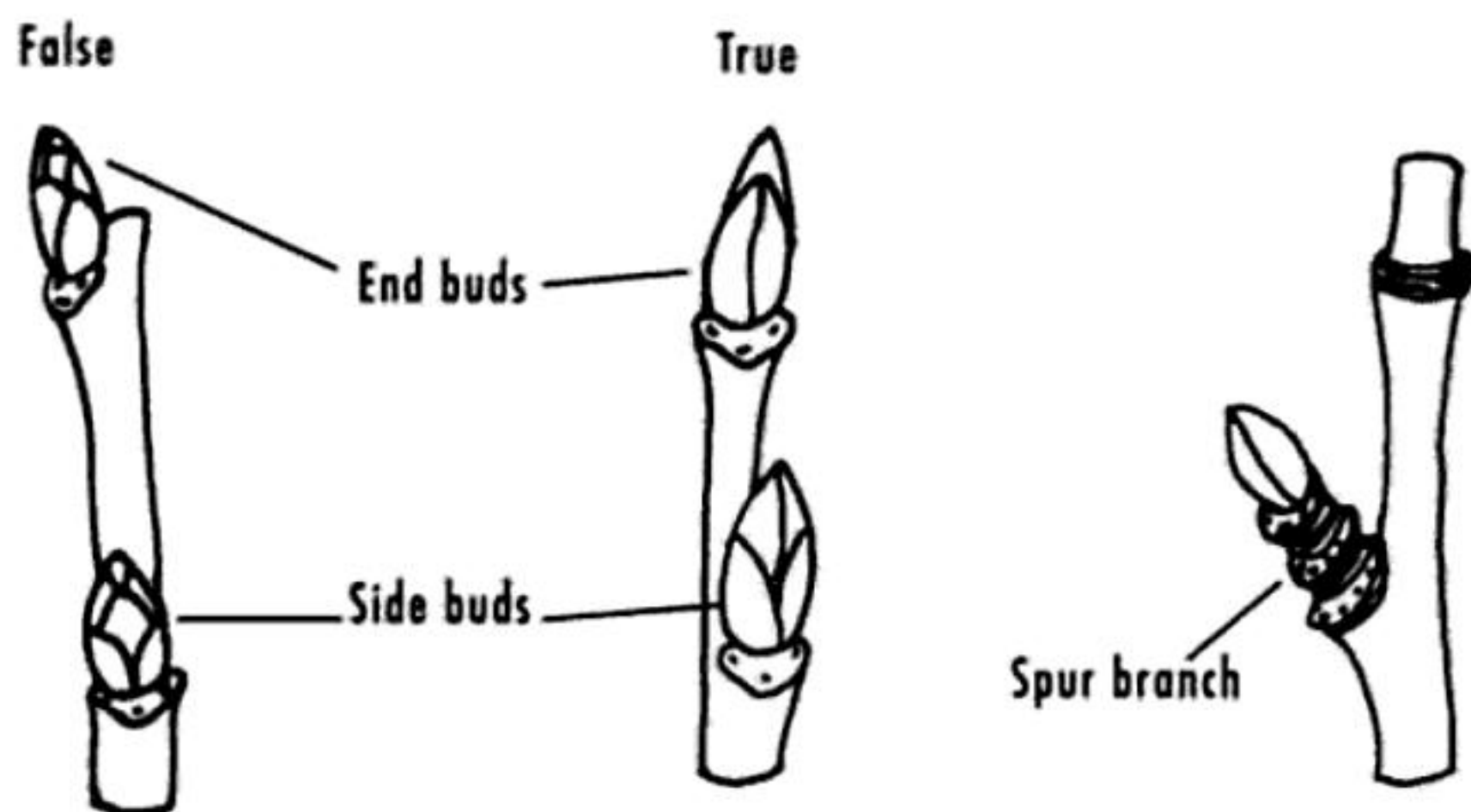


Fig. 3. Twig and Bud Terminology



unless otherwise stated. Central end buds are lacking in several species with opposite buds, as shown on Pl. 14.

## PLATES

Each plate displays small groups of plants that most resemble each other in leaf and twig characteristics whether or not they are related to each other. Wherever possible, however, related species have been depicted on plates as close together as possible, given the main objective of grouping plants similar in appearance.

Not all specimens precisely match the illustrations, but the pictures do offer the designated critical points of identification. Stipules (see Fig. 1) have been illustrated only when they are of diagnostic value, since they often drop early.

On any one plate, the leaves of the several species have been drawn to the same scale in order to indicate their relative size. There may be differences in scale for plants shown on different plates. Leaf and plant sizes are given in the text. The illustrations of twigs, buds, and other small parts have often been enlarged to make their details more readily evident.

## COMPARISON CHARTS

Opposite each plate is a comparison chart. These compact charts can be scanned readily, with similarities and differences among species quickly becoming evident. The charts offer an improved approach to "keying out" a plant in that they summarize and compare in one place the several differences between similar species. Even in a given season, trees can rarely be distinguished by a single field mark. Key features are not always present or may not be readily apparent on the specimen at hand (leaves, flowers, or fruits may be absent, for instance). The plates and appropriate comparison charts alone should suffice to identify an unknown tree.

The comparison charts indicate whether a species does (+) or does not (–) possess a particular characteristic or whether it possesses that characteristic in an intermediate or variable ( $\pm$ ) form. In some cases, various space-saving combinations of these symbols are used to represent measurement data. In such instances, they are coded in a footnote. In general, the charts list first the features most important for identification. One should therefore read the plus-or-minus columns from left to right. Additional descriptive notes indicate further distinctive characteristics.

Because most species have limited distributions, it is helpful to recognize those that can be expected in the region being visited. The first column of each chart, therefore, attempts briefly to indicate the major geographic range of each species within the west-



ern United States and Canada. A footnote for each chart will identify the code letters involved. In general, they will agree with the regions mapped on the frontispiece and will proceed from north and west toward south and east.

Major areas coded are P = Pacific states and British Columbia, including southeast Alaska; C = Canada/Alaska (except for the northern Pacific slope, see P); B = Great Basin, involving most of Nevada plus nearby portions of adjoining states; S = southwestern states from southeast California to west Texas; R = Rocky Mountains; T = Texas; E = eastern trees that range westward on the Great Plains or are widely planted in the West; w = widespread distribution over several regions; I = species introduced from foreign areas and now growing wild in the West. Occasionally a special code letter (O = Oklahoma) will indicate a subregional distribution. Except for w (see above), lowercase (small) letters are used to indicate portions of an area (i.e., California) to which an entire plate (or major segment) is devoted.

Species occurring along the Mexican border can be expected to occur also in the adjoining state(s) of Mexico. B.C. in the text and charts always means British Columbia; Baja California is always spelled out. The distribution areas given in the charts and mapped on the frontispiece represent merely a general guide to assist in identification; reference also should be made to the more detailed maps in the text. General comments on the distribution of western trees also are given on p. 16.

Species not illustrated but similar to those on the plate have their names in parentheses on the chart. Key recognition points for these trees are given on the comparison chart and in the text.

## IDENTIFYING UNKNOWN PLANTS

Collecting plants for identification and study is a practice that has long been sanctioned by science. Collections should be made, however, in moderation and under suitable conditions. Collecting wild plants must be balanced against the need to preserve natural values. In some areas, including national and state parks and monuments, it is illegal to collect plants without a permit.

From the standpoint of making an accurate identification, it is better to make identifications in the field than to collect specimens to be named at home or in camp. When collected specimens are examined later, you may find that important characteristics such as milky sap, spicy odors, bark pattern, and growth habits had not been noted. Fallen leaves and fruits that might have provided useful clues also may have been overlooked.

If, nevertheless, you find it desirable to collect a specimen for later study, keep in mind that a good specimen is essential for cor-



rect identification. Avoid dwarfed, twisted, and gnarled branches. From a vigorous specimen, clip 6 inches to a foot of the branch tip so that both leaf and twig characteristics are present.

With the unknown tree or specimen at hand and turning to the proper section of the book, you can scan the several plates and select the species that most resembles the unknown plant. When leaves are absent, use the leafless key at the end of the book as well as the illustrations and text descriptions.

In summer, the first step in identifying an unknown plant is to place it in one of the six main groups, according to leaf type and arrangement (see Fig. 4):

1. Leaves needlelike or scalelike	Section I, p. 119
1. Leaves broad. 2	
1. Palms, cacti, yuccas.	Section VI, p. 376
2. Leaves opposite or whorled. 3	
2. Leaves alternate. 4	
3. Leaves compound.	Section II, p. 187
3. Leaves simple.	Section III, p. 205
4. Leaves compound.	Section IV, p. 219
4. Leaves simple.	Section V, p. 258

You should turn next to the proper section, scan the plates, and select the species most like the unknown one. It is important then to review the facing *comparison charts* and to follow up by checking the *distribution maps* and reading the *text descriptions* of the several probable species. Verify that the specimen and its geographic range agree with the illustrations and text or else make another attempt to run it down. The text discussion of similar species may also help you to interpret identification marks.

Since the plates themselves are a pictorial key, you may prefer to disregard the sectional leaf keys and the comparison charts and rely upon spotting the proper illustration. It is often possible to proceed in this way if the species falls in Sections I through IV or in Section VI. Relatively few plants have needlelike, compound, opposite, or palm-frond leaves. Approximately half of all western trees have alternate simple leaves, however, and thus fall into Section V. Unless a Section V specimen has other quite distinctive characteristics, therefore, it may be best to follow the keys, tables, maps, and so on.

When a tree is without foliage, you must either find leaf remains on or under the specimen (and run some risk of picking up part of another tree) or rely on twig and other leafless charac-



teristics. If you find dried leaves, you can attempt to proceed as you normally would with fresh foliage. Otherwise you should look for good twig specimens. Be sure to check for spur branches. Both the comparison charts and the leafless botanical key (Appendix A) should be used.

The most trying time for the identification of non-evergreen trees is usually early spring, when buds have burst but leaves are small and new twigs soft. For a few weeks then, some plants may be difficult to identify.

## SPECIES DESCRIPTIONS

**PLANT NAMES:** Both common and scientific names are given for each species. Although for many species common names are well established, the same name or a similar one is sometimes also applied to a different, even unrelated, species. Ironwood, for instance, is used around the world as the common name for many species in numerous genera. In this book, species names that include the name of another unrelated group, for example Douglas-fir and Redcedar, are either hyphenated or joined together to indicate that they are not true members of the group.

The scientific names used in this book are mostly those established by the specialists who are compiling the *Flora of North America North of Mexico* (Morin 1993, 1997). This series, now in development, is becoming the basic reference for plant names and classification in the region. For species not yet reached by that flora, two sources are utilized. For trees that occur in California, the names of Hickman (1993) and his collaborators are adopted. For other species, the names listed are mainly those of Little (1979). Full citations of these references are given on page 408. Several oak species listed in Morin (1997) but found in only one locality or very limited area are not included here. Unless markedly distinctive in the field (i.e., Shore Pine, Shasta Red Fir, Lombardy Poplar), varieties or other subdivisions of species are not emphasized.

In an effort to assist in standardization, the common name approved by the U.S. Forest Service and given by Little's *Checklist* has generally been chosen for use in this book. In a few instances, if a name used in an earlier edition of this Field Guide seemed to offer advantages (by being more descriptive, by better indicating plant relationships, or by involving only one or two words), it was either retained or given in parentheses as a second choice. For some species in southern (tropical) Texas, the common names suggested by Little evidently are not in common use there. In a few such cases I have supplied the names employed by local botanists and confirmed by Correll and Johnston in their



*Manual of the Vascular Plants of Texas.* Pronunciation guides given here to names of Mexican origin have been provided by experts.

Scientific names have three essential parts: the name of the *genus* (plural, *genera*), the name of the *species* (plural, *species*), and the name or names, commonly abbreviated, of the botanist(s) who assigned the scientific names and who stand(s) as the authority(ies) behind it. In the case of *Acer negundo* L., for example, the initial stands for Carolus Linnaeus (also known as Carl von Linné), who is regarded as the father of systematic botany.

Varieties are recognizably distinct subpopulations of a species. In most instances, the distinction is minor. Only a few varieties in our area (i.e., Arizona Pine and Fernleaf Lyontree) are sufficiently different from the typical species to require separate identification. The parental forms of several other varieties (Texas Buckeye, Lombardy Poplar, and California Hazelnut) do not occur in the West, thus only the variety is described. In plant varieties, the varietal name and the name of the authority (or authorities) responsible for it follow the scientific name of the species, as in *Pinus ponderosa* var. *arizonica* (Engelm.) Shaw.

A main purpose of scientific nomenclature is standardization, so that botanists anywhere in the world may discuss a plant with the assurance that they are indeed dealing with the same species. Scientific nomenclature is an international cataloging system that also indicates plant relationships within certain limits. Unfortunately, scientific names may change as authorities decide that a species is more closely related to members of a genus different from that to which it was first assigned, that plants once considered to belong to two species should instead be regarded as two varieties of a single species, that a species originally thought to be new has already been named, and so forth.

The average naturalist should not be too concerned about the many peculiar ways in which scientific names are written. The rules of botanical nomenclature are much too involved to be fully reviewed here. The reader will probably find scientific names of value principally as they make it possible to locate the same species accurately in other reference books. If they are used in this way, care must be taken that the name of the author who assigned the name as well as the Latin portions of the scientific name are in agreement. (The same name has sometimes been applied inadvertently to different species by different authors.)

In the United States and Canada nowadays, scientific names tend to be anglicized when spoken, and most pronunciations are acceptable. One should not hesitate to use them. Anyone who can say *arbutus*, *eucalyptus*, *rhododendron*, or *yucca* is already



using scientific names. In speech, the authors' names are usually omitted.

**RECOGNITION:** This guide limits plant descriptions largely to their general distribution and identification characteristics. A statement of the general distributional range of the species is followed by characteristics of foliage and twigs. Where individual differences may cause confusion in identification, their extent has been indicated in the text. I have attempted to describe degrees of hairiness where it was possible to do so, but the exact extent of hairiness in leaves and twigs is sometimes difficult to indicate in words. Nearly all leaves will show some fine hairs if they are examined closely under a hand lens. Plants described in the text or on the plates as being hairy are usually markedly so. On "hairless" plants, hairiness is not conspicuous.

Measurements are given for leaf lengths, plant heights, and trunk diameters, and sometimes for leaf widths, bud lengths, and other characteristics. Minimum and maximum leaf lengths are generalizations for normal leaves and *include the length of the leafstalk* unless otherwise stated. Sprouts of some species bear abnormally large leaves. The common minimum height and diameter for mature trees often are followed by the common maximum for each measurement and, in parentheses, the exceptional maximum. Diameters are for tree trunks at breast height (about 4½ feet above the ground)—the forester's d.b.h. These figures are given as only general guides. The several maximum measurements are not usually all evident on a single specimen. All measurements are given in feet, inches, and fractions rather than in metric system units, since English units are more widely familiar in our area. The rule printed on the back cover permits leaf and bud measurements readily to be converted to metric units. Measurements given without other designation indicate length.

Flower and fruit data have been supplied only to the extent that, as general identification characteristics, they usefully supplement vegetative characteristics. Further details are provided mainly for those species not easily recognized by leaf and twig characteristics alone.

Flowers, of course, develop into fruits. The shape of a tree's fruit clusters, not always mentioned, therefore will be of the same type as the clusters described for the flowers. The extreme dates given for flowering and fruiting may need to be modified by a month or so, depending on locality. Where fruiting dates are lacking, dates for the flowers will indicate at least the earliest possible time when fruits might appear. Fruit colors apply to ripe fruits only. Descriptions of bark refer to the mature bark of large stems



unless otherwise indicated. The habitat named indicates the vegetation or soil type in which the species is usually found.

General statements regarding the distinctiveness of certain species' characteristics apply to the area covered by the book.

**SIMILAR SPECIES:** Critical differences are discussed for species that most closely resemble one another, both when they are in foliage and when they are leafless.

**DISTRIBUTION:** Maps showing the limits of distribution in the areas north of Mexico have been published for most tree species in several volumes of Little's *Atlas of United States Trees*. These maps have been followed in preparing the book. Where the range is described verbally, distributional limits are reported from northwest to northeast and southwest to southeast. The distribution of a few species based mainly in Mexico is given from that country northward. Several tree groups (cypresses, junipers, ashes, poplars, yuccas) are mapped collectively in numerical style. This was done so that readers in a particular state or region could see at a glance which species are likely to be encountered there. The map for *Quercus dumosa* was taken from Elias's *Complete Trees of North America*.

**REMARKS:** General observations are given for plants that serve as sources of lumber, fuel, medicine, food, drink, poison, fiber, ornament, tannin, and Christmas trees, or are of special value in soil and wildlife management. References to wildlife are usually limited to game birds and to mammals of chipmunk size or larger. The origins of both scientific and common names are given where known. Good places to visit in order to see certain species also are sometimes mentioned.

## BOTANICAL KEYS

When a dozen or so species are involved, the comparison charts offer advantages in scanning for similarities and differences. In cases where either a very few or a large number of trees must be classified, however, the charts are not handy. In such instances, as at the beginning of each section in the text and in Appendix A, traditional botanical keys are employed. The keys to plant identification may seem formidable at first but should be treated rather like a book's table of contents. Their function is merely to divide the subject matter, in this case plant species, into subsections, further sub-subsections, and eventually species or groups of species.

Using a key is simply a matter of following a trail that forks repeatedly but typically offers only two paths at any single fork.



The seeker continues to make choices between options, making certain at each point that the choice made fits the plant being identified, until an end point is reached. In cases of doubt, it may be necessary to follow each of the two routes offered and then to choose between the resulting determinations.

Everyone would like to discover a rare specimen. Before you conclude that you have found a species outside its usual range or have unearthed something entirely new to science, however, recheck carefully to verify that you do not have a case of mistaken identity. If it still seems likely that the plant is something unusual, you might collect a specimen (with flowers or fruits, if possible, and always with notes indicating the exact location, date of collection, and your own name and address). Carefully press it, dry it, and forward it to the department of botany at your state or provincial university or agricultural college with a request for confirmation of identification.

## EQUIPMENT

Fortunately, tree identification requires little paraphernalia. Only two items are essential: a field guide or manual and a hand lens. *A good hand lens is as essential to the botanical naturalist as binoculars are to the birder.* The hand lens is especially helpful in ascertaining twig characteristics but is also essential for assessing leaf hairiness, leafstalk glands, etc. Furthermore, the lens discloses hidden beauty in small blossoms and other plant parts. Lenses for general use should magnify 6x or 10x. Holding the lens close to your eye makes it almost a part of you. Those manufactured by well-known optical companies are generally worth the slightly higher price usually asked for them. Hand lenses are economical and are practically indestructible. Secondhand ones can often be procured cheaply, especially in university towns. Though seldom necessary under ordinary circumstances, binoculars are handy when the foliage or fruits of tall trees are out of reach. They are useful also in botanical gardens and arboretums to check overhead leaves and to read distant name tags. Pruning shears can be helpful, too, especially in collecting thorny or fibrous specimens.

As previously noted, it is *strongly suggested that identification be made in the field*, where additional specimens and supplementary data are available. When you need to collect specimens, however, a large plastic bag will preserve them until they can be pressed. A roll of newspapers held by a strap, or even a large magazine, may also do well as a field carrier if specimens are being carried for early identification. Serious collectors, however, will want to acquire a plant press. These are available from any biological supply house.



In a press, plants are placed within newspaper pages which are inserted between blotters and placed between sheets of corrugated cardboard. The entire series is packaged between wooden frames and securely tied by straps. Specimens will dry quickly in dry weather if the press can be mounted outside a moving car. A stream of heated air blown through the press will also hasten drying. Otherwise, it is necessary to replace dry newspapers and blotters every few days to permit thorough drying and to prevent molds from invading the collections.

## PLANT SUCCESSION

Every plant species, through evolutionary processes, has become something of a specialist. Each one lives in a certain type of *habitat* and thrives under a particular set of climatic, soil, and moisture conditions. On a newly available site, seeds or other reproductive parts of a number of species usually manage to be present, and some of these will sprout successfully. As a result a *plant community* composed of several species becomes established. As time goes on, plants and plant communities tend to alter the site so that it becomes less and less suitable for them (we are not the only species that fouls its nest!). Increasing soil fertility due to root decay and leaf fall, for example, may invite competition from species originally unable to become established on the site. Alternatively, increasing shade may prevent seedlings from surviving even though they are adjacent to, or are even surrounded by, their parents.

These factors and others bring about *succession* whereby plant communities and the soils they occupy pass through a series of stages until a stable community of plants and mature soil structure finally develops. This end product—a mature and relatively permanent community—is the *climax* plant association.

*Primary plant succession* occurs when community development begins and develops from a bare surface or in open water. Primary succession may begin on such areas as cliff faces, rock slides, gravel slopes, road cuts, sand dunes, lava flows, peat deposits, or on shallow lake bottoms, in bogs, or on river bars and deltas. In such places *pioneer* communities become established and are eventually succeeded by other plant communities, each of which tends to be more intermediate in its moisture requirements than its predecessor. That is, within the limits set by climate, succeeding communities beginning in a wet environment live on progressively drier sites, while those in a dry environment live on moister sites, with the climax community occurring on neither wet nor dry sites but on intermediate moist ones.

*Secondary plant succession* occurs when a plant community is



entirely or partly killed or removed, exposing a soil that has already advanced to some degree toward maturity. Such plant destruction might be accomplished by fire, trampling, drainage, wind damage, lumbering, cultivation, or other means. The secondary plant community series that follows a change in the original vegetation generally differs from the primary successional series.

Species in developmental stages of plant succession may be geographically more widespread than those of the climax stage. Some species may occupy somewhat different habitats and successional stages in different portions of their ranges, whereas others are restricted to only a portion of a single climax area.

Knowledge of local successional stages is essential in studies of land use, soil conservation, forestry, wildlife management, and outdoor recreation. The amateur botanist will find it an interesting and valuable project to prepare a succession chart for his or her locality; see Oosting's *Study of Plant Communities*.

## DISTRIBUTION OF WESTERN TREES

The temperature and precipitation limits that affect the survival of each tree species also govern the development of soils upon which they depend. Topography can cause climates, soils, and vegetation to vary widely between locations at different altitudes. The number of tree species to be found in a particular locality tends to be limited. In the West, different environments with different tree floras may be only a few miles apart.

Plants that grow at low elevations in the far north may occur on high slopes much farther south. A person ascending a mountain road from a southern lowland location may pass through several vegetative zones and finally reach timberline and alpine tundra with northern characteristics.

In Alaska and western Canada, the farthest-north belt of spruce-fir (boreal) forests extends south of the treeless arctic tundra and eastward across the continent to Newfoundland and Maine. Following the cold climates at increasingly higher altitudes, a zone of similar coniferous trees extends southward along the Rocky Mountains, Cascades, the Sierra Nevada and Coast Ranges deep into Mexico. Differing in the species of trees involved is the complex of Pacific Forest conifers that extends south along the Pacific slope from Kodiak Island, Alaska, to San Francisco Bay and beyond. Southward along the Pacific Coast a zone of shrubby chaparral or coastal scrub vegetation also contains a number of tree species.

Away from the coast, the Great Basin area lies between the Sierra Nevada and Rockies. It extends north to the grasslands of

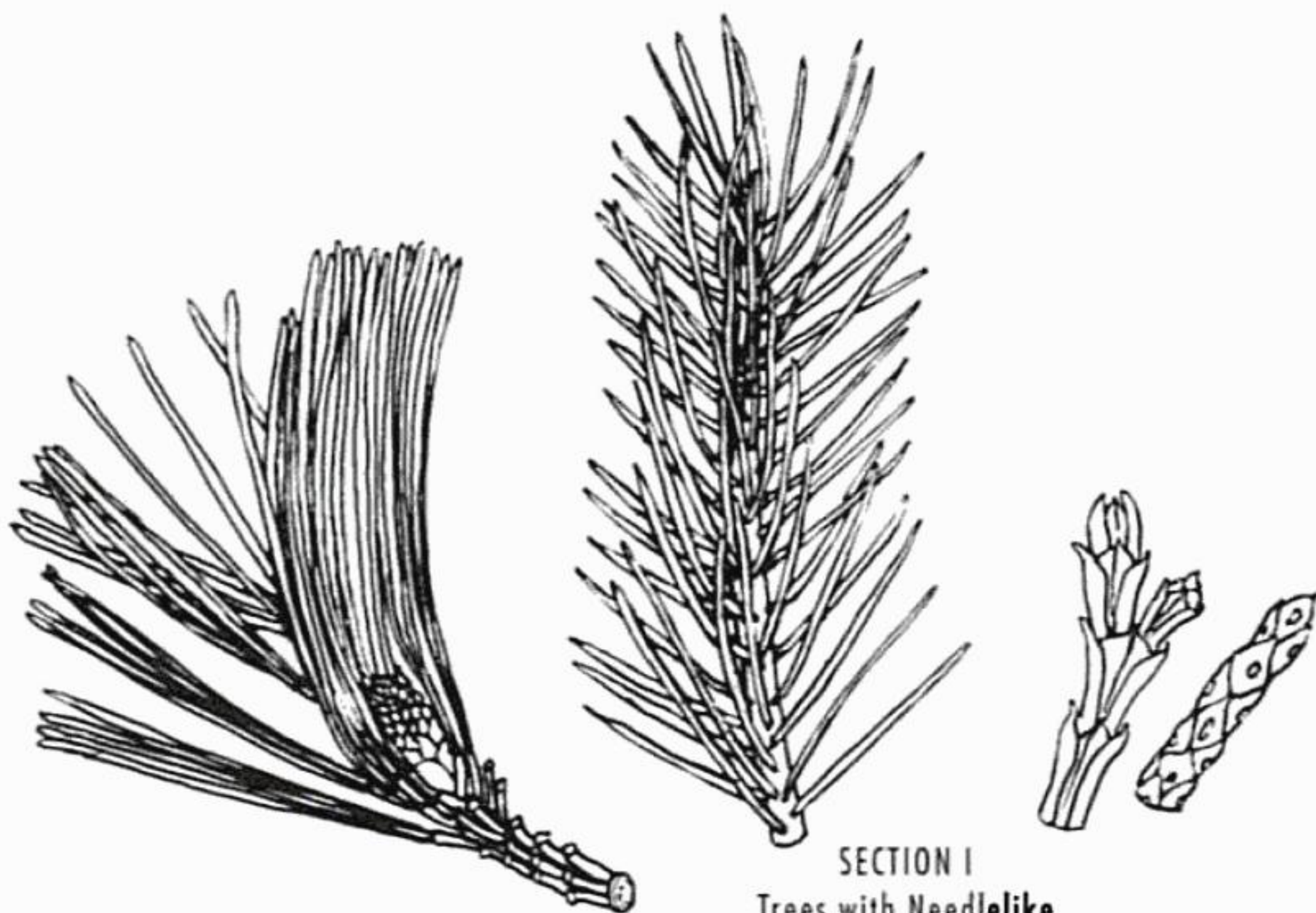


eastern Oregon, eastern Washington, and southern Idaho and south to the arid portions of southern California, southern Nevada, and northwest Arizona. Adjacent and to the south, the Mohave, Sonoran, and Chihuahuan deserts occupy much of southern California, Arizona, southwestern New Mexico, and southwestern Texas. With the numerous mountain areas within their borders, a varied tree flora is supported in these areas. East of the Rocky Mountains and south of the Canadian forests, the Great Plains range eastward to meet the deciduous forest of the eastern United States.

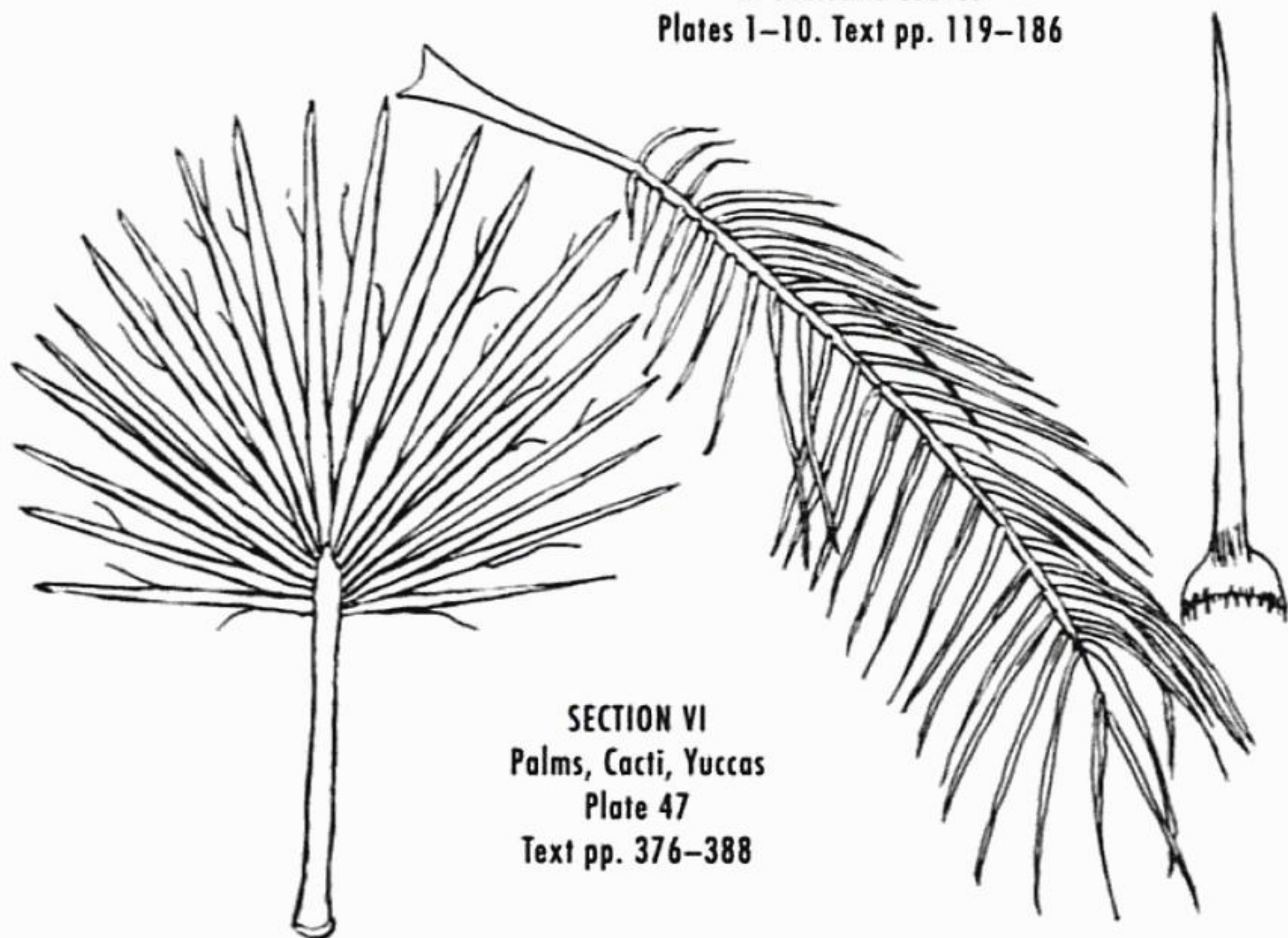


# ILLUSTRATED PLAN OF THE SIX MAIN SECTIONS

*Figure 4*



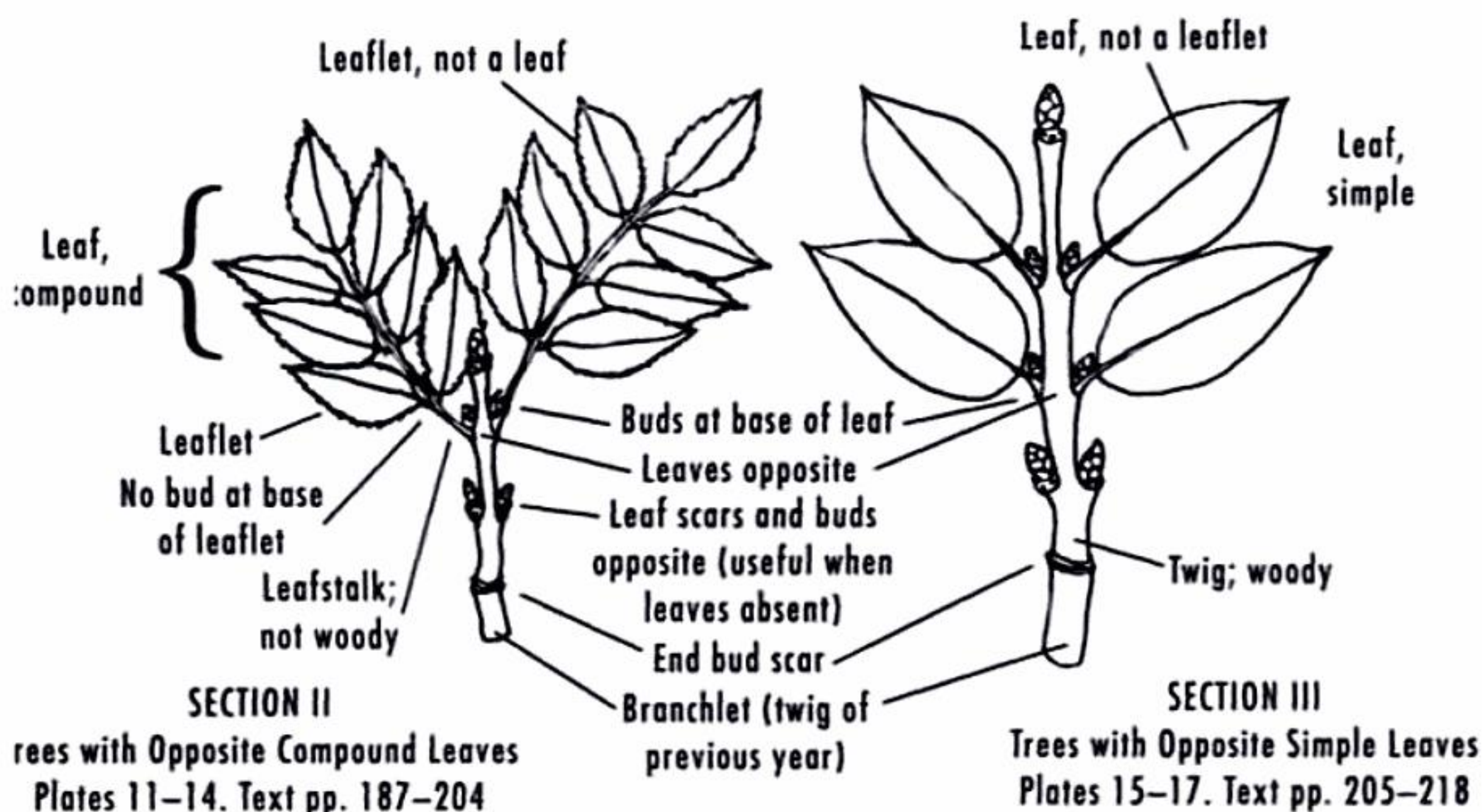
SECTION I  
Trees with Needlelike  
or Scalelike Leaves  
Plates 1–10. Text pp. 119–186



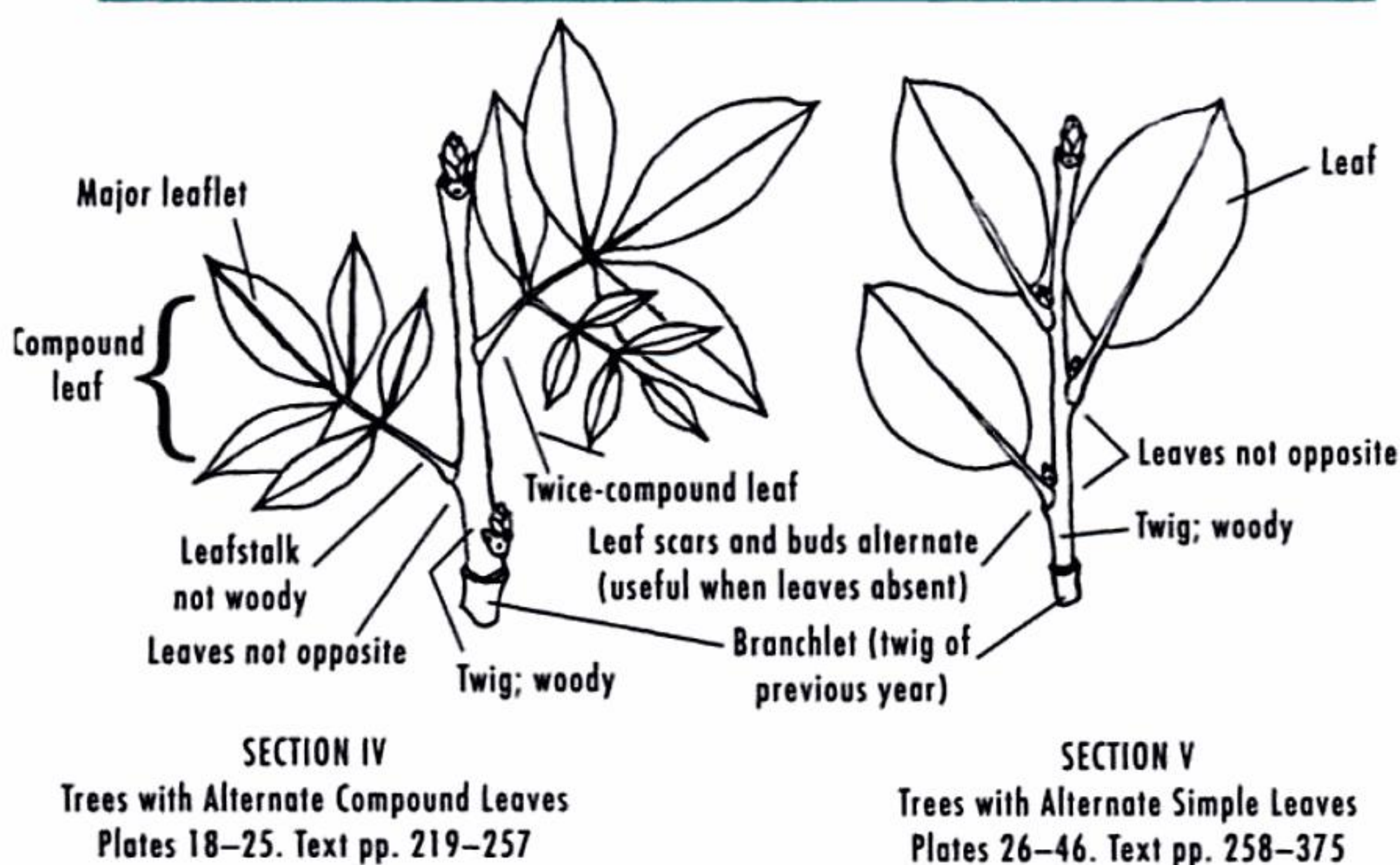
SECTION VI  
Palms, Cacti, Yuccas  
Plate 47  
Text pp. 376–388



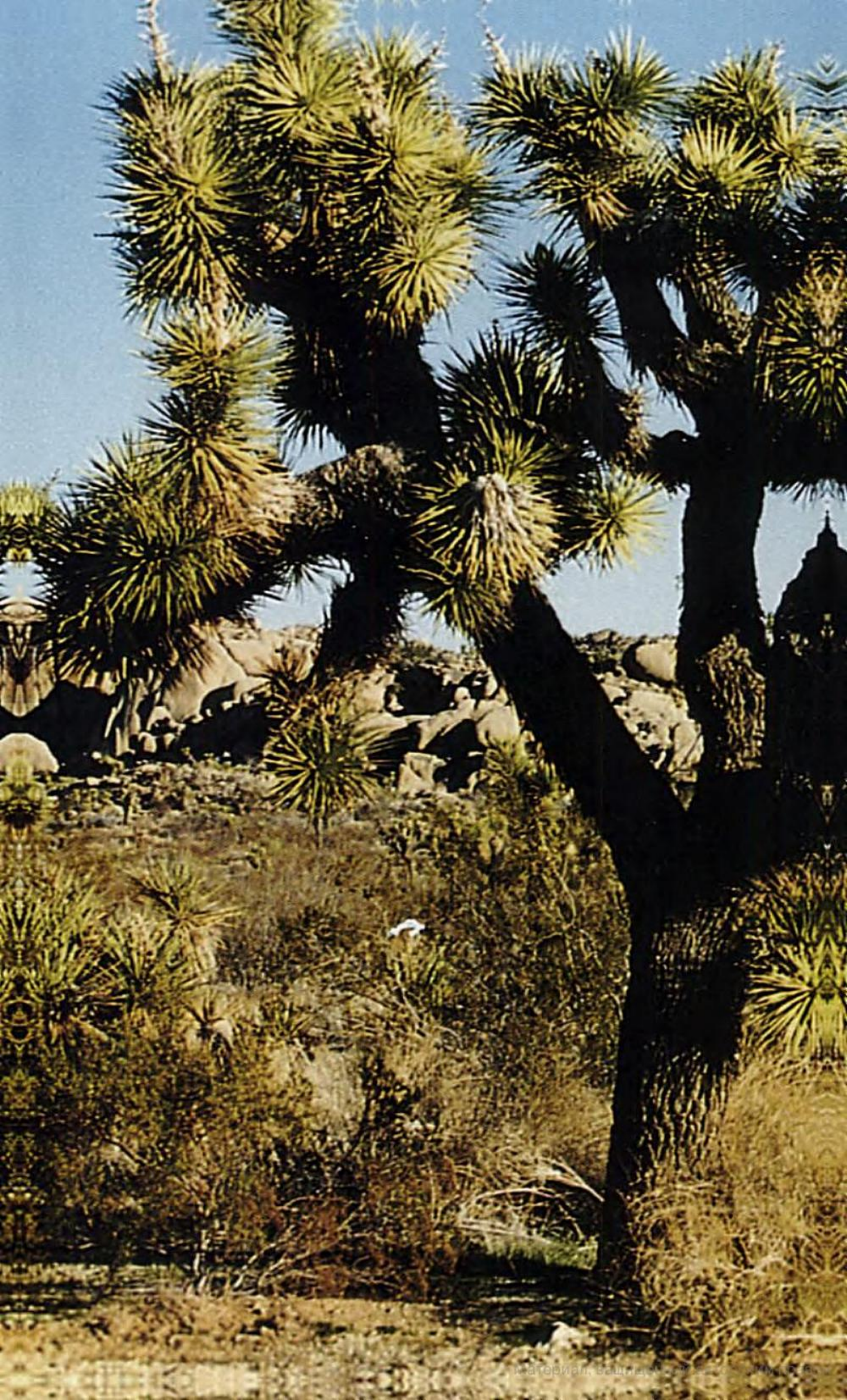
## LEAVES OPPOSITE OR IN WHORLS



## LEAVES (*not leaflets*) ALTERNATE











# PLATES



# CONE-BEARING EVERGREEN TREES WITH CLUSTERED NEEDLES: LARCHES, 1 - AND 2-NEEDLE PINES, AUSTRALIAN-PINE

Larches: Needles 12–14 on warty spur branches, single on long twigs, drop in autumn. True Cedars: Foreign park trees resembling larches but evergreen, see p. 124. Pines I: Needles in bundles, evergreen, 1- and 2-needle pines<sup>1</sup> on this plate; 3–5-needle pines on Pls. 2–4.

## SPECIES AND REMARKS

	Major distribution <sup>2</sup>	Max. needle length (in.)	Needles shade of green <sup>3</sup>	Max. cone length (in.)	Size of cone prickles <sup>4</sup>	Many old cones on tree	Text page
<b>TAMARACK</b> <i>Larix laricina</i> (American Larch) Cone bracts hidden.	C	1	Y	¾	0	–	121
<b>(EUROPEAN LARCH</b> <i>Larix decidua</i> ) Twigs droop, bracts pointed.	I	1½	Y	1½	0	–	122
<b>WESTERN LARCH</b> <i>Larix occidentalis</i> Twigs ± hairy, bracts pointed.	PR	1¾	Y	1½	0	–	122
<b>SUBALPINE LARCH</b> <i>Larix lyalli</i> Twigs woolly, bracts toothed.	PR	1½	B	2	0	–	123
<b>(TRUE CEDARS</b> <i>Cedrus species</i> ) Evergreen, cones and scales broad.	I	1–2	B	2–5	0	–	124
<b>SINGLELEAF PINYON</b> <i>Pinus monophylla</i> Needle 1 (–2), thick, spine-tipped.	B	2¼	G	3	0	–	126
<b>TWO-NEEDLE PINYON</b> <i>Pinus edulis</i> Cone scales thick, blunt; southern.	R	2	D	2	0	–	127
<b>LOGEPOLE/SHORE PINE</b> <i>Pinus contorta</i> Cones not heavy, scales thin.	RP	3	YD	2	–	+	127
<b>(AUSTRIAN PINE</b> <i>Pinus nigra</i> ) Mature bark plates gray-yellow.	P	3–6	D	2–4	±	–	128
<b>(JACK PINE</b> <i>Pinus banksiana</i> ) Needles short, cones curved.	C	1½	Y	2½	–	+	129
<b>BISHOP PINE</b> <i>Pinus muricata</i> Cones stout, scales thick; coastal.	P	6	D	3½	+	+	129
<b>(PONDEROSA PINE</b> <i>Pinus ponderosa</i> ) Some 2-needle clusters; Pl. 3.	w	10	Y	6	±	–	135
<b>AUSTRALIAN-PINE</b> <i>Casuarina equisetifolia</i> Needles jointed, droop; not a true pine.	I	12	Y	1	0	±	129

<sup>1</sup> All with cones egg-shaped and short-stalked; leaf sheaths short except in Bishop Pine, Austrian Pine, and Lodgepole/Shore Pine.

<sup>2</sup> B = Great Basin; C = Canada/Alaska; I = foreign introduction, mostly plantings; R = Rocky Mts.; P = Pacific states and B.C.; w = widespread.

<sup>3</sup> B = blue-, D = dark-, G = gray-, Y = yellow-green.

<sup>4</sup> 0 = none; – = small, slender; ± = medium, + = large.



<sup>5</sup> Bracts are located between cone scales.



TAMARACK



WESTERN LARCH



SUBALPINE LARCH



SINGLELEAF PINYON



TWO-NEEDLE PINYON



LODGEPOLE/  
SHORE PINE



BISHOP PINE



AUSTRALIAN-PINE





PINES II: 3-NEEDLE PINES OF CALIFORNIA  
AND ITS BORDERS

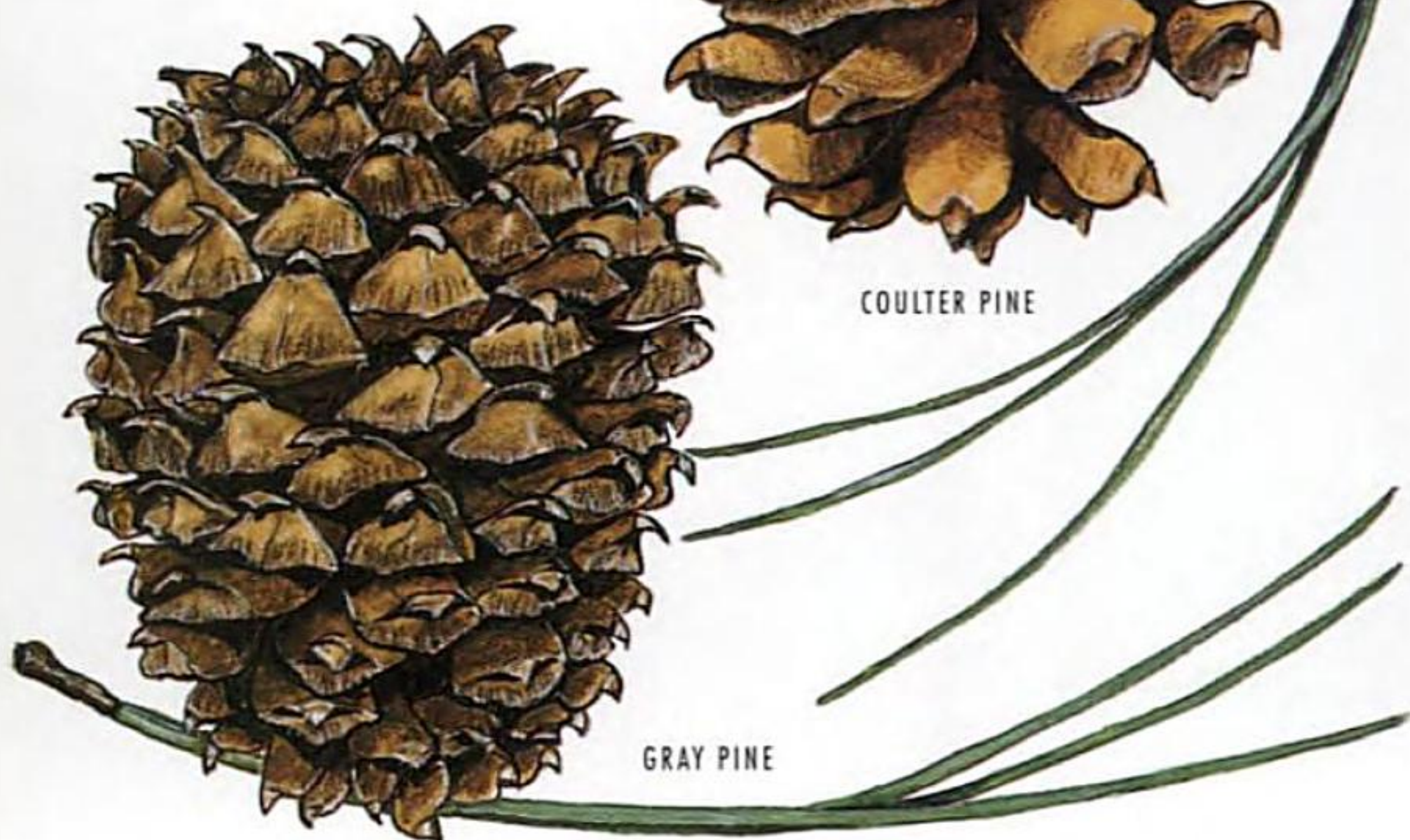
Six 3-needle (yellow or hard) pines occur mainly in Calif.<sup>1</sup> with three species barely extending into sw. Ore. and/or w. Nev. Needle bases bound by durable sheaths 1/8–1/2 in. long. Cones mostly stout, thorny, short-stalked. Mainly mountain slopes. Ponderosa Pine (Pl. 3) is also a widespread 3-needle species in Calif.

SPECIES AND REMARKS

	California distribution <sup>2</sup>	Max. needle length (in.)	Cone length <sup>3</sup>	Cone thorn size <sup>4</sup>	Cone thorns curved	Many old cones on tree <sup>5</sup>	Text page
<b>Knobcone Pine</b> <i>Pinus attenuata</i> Cone curved, one side knobby.	w	6	M	M	+	+	130
<b>Monterey Pine</b> <i>P. radiata</i> <sup>1</sup> Cone off-center; scales thick.	cc	6	S	S	–	+	131
<b>Washoe Pine</b> <i>P. washoensis</i> Local ne. Calif., w. Nev.	ne	6	VS	M	–	–	131
<b>(Ponderosa Pine)</b> <i>P. ponderosa</i> . <sup>6</sup> Cone dull; bark flaky, yellow.	w	10	S	M	+	–	135
<b>Jeffrey Pine</b> <i>P. jeffreyi</i> <sup>7</sup> Cone shiny; bark tight, rosy.	w	10	L	M	±	–	132
<b>Coulter Pine</b> <i>P. coulteri</i> <sup>1, 8</sup> Trunk single; cone massive, buff.	sc	12	VL	L	+	+	133
<b>Gray Pine</b> <i>P. sabiniana</i> <sup>1, 8</sup> Trunk forked; cone heavy, dark.	w	14	L	L	±	+	134

<sup>1</sup> Three species occur naturally only in Calif. (2 also in nearby Mexico).  
<sup>2</sup> cc = central coast, ne = northeastern mountains, sc = southern and central coastal mountains, w = widespread in California mountains.  
<sup>3</sup> Cones: VS = very short, 2–4 in.; S = short, 3–6 in.; M = medium, 3–7 in.; L = long, 6–10 in.; VL = very long, 10–14 in.  
<sup>4</sup> L = very large, M = medium, S = small or lacking.  
<sup>5</sup> Also cone bases off-center and scale tips very thick.  
<sup>6</sup> Some needles in twos, see Pls. 1 and 3; “bark” refers to mature trunk.  
<sup>7</sup> Trunk with nice pineapple odor when nose pressed into bark furrows.  
<sup>8</sup> Coulter Pine twigs 1/2–1 in. thick; Gray Pine twigs 1/8–1/4 in. thick.







PINES III: PONDEROSA PINE  
PLUS 3-NEEDLE PINES OF THE MEXICAN BORDER

Ponderosa Pine is common throughout the western U.S. and s. British Columbia. Three other pines with needles in clusters of 3 are distributed from Ariz. to cen. Texas. Needle sheaths are soon shed in Mexican Pinyon and Chihuahua Pine. Cones mostly egg-shaped; stalks minimal in two species.

SPECIES AND REMARKS	Major distribution <sup>1</sup>	Needle length (in.)	Needle shade of green <sup>2</sup>	Cone length (in.)	Cone prickle size <sup>3</sup>	Cone prickle curved	Many old cones on tree	Color of mature bark <sup>4</sup>	Text page
<b>PONDEROSA PINE</b> <i>Pinus ponderosa</i> <sup>5</sup> Twigs ¼–½ in. thick, sheaths ½–1 in.	w	4–10	Y	3–6	±	+	–	Y	135
<b>MEXICAN PINYON</b> <i>P. cembrioides</i> Needles stout; cone stalks short.	ST	1–2½	B	1–2	o	o	–	D	136
<b>CHIHUAHUA<sup>6</sup> PINE</b> <i>P. leiophylla</i> Needles slender, cone stalks ½ in.	S	2½–4	B	1½–3	–	–	+	D	136
<b>APACHE PINE</b> <i>P. engelmannii</i> Twigs ½–1 in. thick, sheaths 1–1½ in.	S	8–15	D	4–6	±	±	–	Y	137

<sup>1</sup> S = se. Ariz./sw. N.M.; ST = se. Ariz./sw. N.M./cen. and w. Texas; w = widespread.  
<sup>2</sup> B = blue-, D = dark-, Y = yellow-green.  
<sup>3</sup> o = none, – = small, ± = medium.  
<sup>4</sup> D = dark, Y = yellow.  
<sup>5</sup> See also Pls. 1 and 2.  
<sup>6</sup> chee-WAH-wah.







PONDEROSA PINE



MEXICAN PINYON



CHIHUAHUA PINE



APACHE PINE





PINES IV: 5-NEEDLE PINES  
WITH NEEDLES 2 1/2-13 IN. LONG

Five-needle (white or soft) pines have slender leaves bound at the base by deciduous sheaths whose remnants are 1/32-1/16 in. long. Cones mostly elongated and slim, dropping early, their scales thin and with small slender prickles or none, usually present beneath the tree. Arizona and Torrey pines have wider cones and long leaf sheaths. Seeds winged.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Needle length (in.)	Needle shade of green	Cone length (in.)	Cones long-stalked	Cone scales with prickles	Seeds longer than wing	Text page
<b>SOUTHWESTERN WHITE PINE</b> <i>Pinus strobiformis</i> Cones ± heavy, <sup>2</sup> scales turned back.	S	2 1/2-3	B	5-9	-	-	+	138
<b>SUGAR PINE</b> <i>P. lambertiana</i> <sup>3</sup> Trunk bark scaly, ridged.	P	2 1/2-4	B	11-20	+	-	-	138
<b>WESTERN WHITE PINE</b> <i>P. monticola</i> <sup>3</sup> Mature trunk bark often in small, square plates.	PR	2 1/2-4	B	5-10	+	-	-	139
<b>TORREY PINE</b> <i>P. torreyana</i> <sup>4</sup> Twigs 1/4-1/2 in. thick; local Del Mar, Calif. & S. Rosa Is. Cones may persist.	P	8-13	D	4-6	+	±	+	140
<b>ARIZONA PINE</b> <i>P. ponderosa</i> var. <i>arizonica</i> <sup>4</sup> Twigs 1 1/4-1 in. thick; parent species Pl. 3.	S	4-10	Y	2-3 1/2	-	+	-	141

<sup>1</sup> P = Pacific states; PR = Pacific states, n. Rockies, and nearby Canada; S = Southwest.  
<sup>2</sup> For a white pine species.  
<sup>3</sup> Mature cone scale widths: Sugar Pine 1-1 1/2 in., Western White Pine 1/4-1 in.  
<sup>4</sup> Needles in 5s though member of the yellow pine group.





SOUTHWESTERN  
WHITE PINE

SUGAR  
PINE

WESTERN  
WHITE PINE



ARIZONA PINE

TORREY  
PINE



# PINES V: 5- (OR 4-) NEEDLE PINES WITH NEEDLES 1-2 1/4 IN. LONG

Like the typical white pines of Pl. 4 but with foxtail,<sup>1</sup> nut,<sup>2</sup> and stone<sup>3</sup> pine characteristics. Needles mostly 5 per bundle and bound by basal sheaths of minimal (1/32-1/16 in.) length. Cones fall early, stalks short or absent, cone scale prickles slender or lacking. Mostly alpine species. Needles sometimes to 3 in. long.

## SPECIES AND REMARKS

	Major distribution <sup>4</sup>	Needle length (in.)	Needle shade of green <sup>5</sup>	Cone length	Cones ± cylindrical	Cone scales thick	Text page
<b>INTERMOUNTAIN BRISTLEcone PINE</b> <i>Pinus longaeva</i> <sup>1, 8</sup> Cone bristles 1/16-1/4 in.	BR	1-1 1/2	D	3-3 1/2	+	-	142
<b>FOXTAIL PINE</b> <i>P. balfouriana</i> <sup>1, 6</sup> Prickles tiny or none; 2 areas only.	P	1-1 1/2	D	3-5	+	-	143
<b>PARRY PINYON</b> <i>P. quadrifolia</i> <sup>2</sup> 4 needles; sw. Calif. mountains.	P	1-1 1/2	Y	1 1/2-2 1/2	-	+	143
<b>WHITEBARK PINE</b> <i>P. albicaulis</i> <sup>3</sup> Cones dark; scales pointed, closed.	PR	1 1/2-2 1/2	Y	1-3	-	+	144
<b>LIMBER PINE</b> <i>P. flexilis</i> <sup>3, 7</sup> Cones buff, scales rounded, open.	RB	1 1/2-2 1/2	Y	3-6	+	±	145

<sup>1</sup> Bristlecone and Foxtail pines retain the needles along the last 10 years or so of branchlet growth, giving a foxtail appearance to each branch tip.

<sup>2</sup> Parry Pinyon, along with Singleleaf and Two-leaf pinyons (Pl. 1) and Mexican Pinyon (Pl. 2), produce tasty nuts.

<sup>3</sup> Resembling the Swiss Stone (Arolla) Pine (*Pinus cembra* L.) of cen. Europe; twigs very flexible in both Whitebark and Limber pines.

<sup>4</sup> B = Great Basin, P = Pacific states, R = Rocky Mts.

<sup>5</sup> D = dark-, Y = yellow-green.

<sup>6</sup> Native in Klamath Mts., n. Calif., and again in s. Sierras.

<sup>7</sup> Also e.-cen. and s. Calif.

<sup>8</sup> See text for related species in the Rockies, where scattered white resin dots on the needles assist in identification.





BRISTLECONE PINE



PARRY  
PINYON



FOXTAIL  
PINE



WHITEBARK  
PINE



LIMBER PINE



CONIFERS WITH SINGLE NEEDLES  
ON WOODY PEGS: SPRUCES

Cone-bearing evergreen trees whose dead branchlets and twigs are much roughened by tiny woody pegs. Mature cones woody, brown, hanging near twig ends. Needles short, mostly stiff and sharp, typically 4-sided but flattened in two species. Bark mostly thin and scaly. Hemlocks (Pl. 8) have weak needle-pegs.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Needles flattened <sup>2</sup>	Needle length (in.)	Needle shade of green <sup>3</sup>	Twigs hairy <sup>4</sup>	Cone length (in.)	Cone scale tips ragged	Text page
<b>SITKA SPRUCE</b> <i>Picea sitchensis</i> Branchlets/twigs droop; coastal.	P	+	3/4-1	D	-	2-4	+	146
<b>WEeping SPRUCE</b> <i>P. breweriana</i> <sup>5</sup> Branchlets/twigs weep strongly.	P	+	3/4-1	Y	+	2-4	-	147
<b>ENGELMANN SPRUCE</b> <sup>7</sup> <i>P. engelmannii</i> <sup>6</sup> Bark brown, thin, scaly; needles flexible.	R	-	3/4-1	BD	±	1 1/2-2 1/2	+	148
<b>BLUE SPRUCE</b> <i>P. pungens</i> <sup>7</sup> Bark dark, thick; needles stiff.	R	-	3/4-1 1/4	BD	-	2 1/2-4	+	149
<b>WHITE SPRUCE</b> <i>P. glauca</i> Tundras, drier soils; scales flexible.	C	-	3/8-3/4	YB	-	1 1/2-2	-	149
<b>BLACK SPRUCE</b> <i>P. mariana</i> Tundras, bogs; many old cones present; scales rigid.	C	-	1/4-7/16	BD	+	3/4-1 1/4	+	150

<sup>1</sup> C = Canada and Alaska, P = Pacific states and B.C., R = Rocky Mts.  
<sup>2</sup> With 2 rather than 4 white stripes; 4-sided needles easily twirled between the fingers.  
<sup>3</sup> B = blue-, D = dark-, Y = yellow-green.  
<sup>4</sup> Use lens after removing needles.  
<sup>5</sup> Native Siskiyou Mts., Ore./Calif.  
<sup>6</sup> Also Cascade Mts. south to n. Calif.  
<sup>7</sup> Central cone scales diamond-shaped in Engelmann Spruce, rounded in Blue Spruce.







SITKA SPRUCE

WEeping SPRUCE



ENGELMANN SPRUCE

BLUE  
SPRUCE



WHITE  
SPRUCE

BLACK  
SPRUCE



# CONIFERS WITH NEEDLES SINGLE AND FLAT (OR 4-SIDED): FIRS

Narrow-crowned trees whose plucked needles leave smooth circular scars on the twigs. Needles short, mostly flat, blunt, grooved above, white-banded beneath. (White bands most evident on fresh new twig-end needles.) Buds mostly blunt. Cones erect, fleshy, often purplish, fall early. Young trunks mostly gray, smooth, with resin blisters. See Douglas-firs, Pl. 8.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Main vertical range <sup>2</sup>	Low needles in flat sprays <sup>3</sup>	Needles whitened above <sup>4</sup>	Shape of needle tips <sup>5</sup>	Needle length <sup>6</sup>	Buds resin-covered, shiny	Cone length (in.)	Text page
<b>GRAND FIR</b> <i>Abies grandis</i> <sup>8</sup> Needles of 2 lengths.	PR	L	+	-	N	M	+	2-4	152
<b>WHITE FIR</b> <i>A. concolor</i> <sup>7</sup> Needles long, U-curved.	PR	M	±	+	RP	L	+	3-5	153
<b>SILVER FIR</b> <i>A. amabilis</i> <sup>8</sup> Twigs hidden from above.	P	M	-	-	N	S	+	3½-6	154
<b>NOBLE FIR</b> <i>A. procera</i> <sup>8,9</sup> Needles thin, 2 stripes each side.	P	M	-	+	R	S	-	4-7	155
<b>RED FIR</b> <i>A. magnifica</i> <sup>10</sup> Needles 4-sided; Sierras and s. Cascades.	P	H	-	+	R	M	+	6-8	155
<b>SUBALPINE FIR</b> <i>A. lasiocarpa</i> <sup>7</sup> Top stripe single, crown narrow.	PR	H	-	+	RN	M	+	2¼-4	156
<b>BRISTLECONE FIR</b> <i>A. bracteata</i> <sup>11</sup> Needles spiny, buds pointed.	P	M	±	-	S	L	-	2½-4	157
<b>(BALSAM FIR</b> <i>A. balsamea</i> ) Needles short; east of Rockies.	C	L	+	-	R	S	+	1-3	158

<sup>1</sup> = Canada; P = Pacific states, B.C., and north; R = Rocky Mts.

<sup>2</sup> L = low, 0-5000 ft.; M = middle, 1500-7000 ft.; H = higher elevations.

<sup>3</sup> - = needle bases J-curved so that needles are mostly upright and bunched on twig and branchlet tops.

<sup>4</sup> As well as beneath; use lens.

<sup>5</sup> Use lens on low needles: N = notched, P = pointed, R = rounded, S = sharp.

<sup>6</sup> S = short, ¾-1 in.; M = medium, ¾-1½ in.; L = long, 1½-2½ in.

<sup>7</sup> For closely related species, see text.

<sup>8</sup> Pacific Northwest region.

<sup>9</sup> Cone bracts long-pointed, hiding cone scales; mainly Cascades, Wash./Ore.

<sup>10</sup> Needles easily twirled between the fingers.

<sup>11</sup> Cone bracts visible, ½-1¾ in. long; native Monterey, Calif., area.





GRAND  
FIR



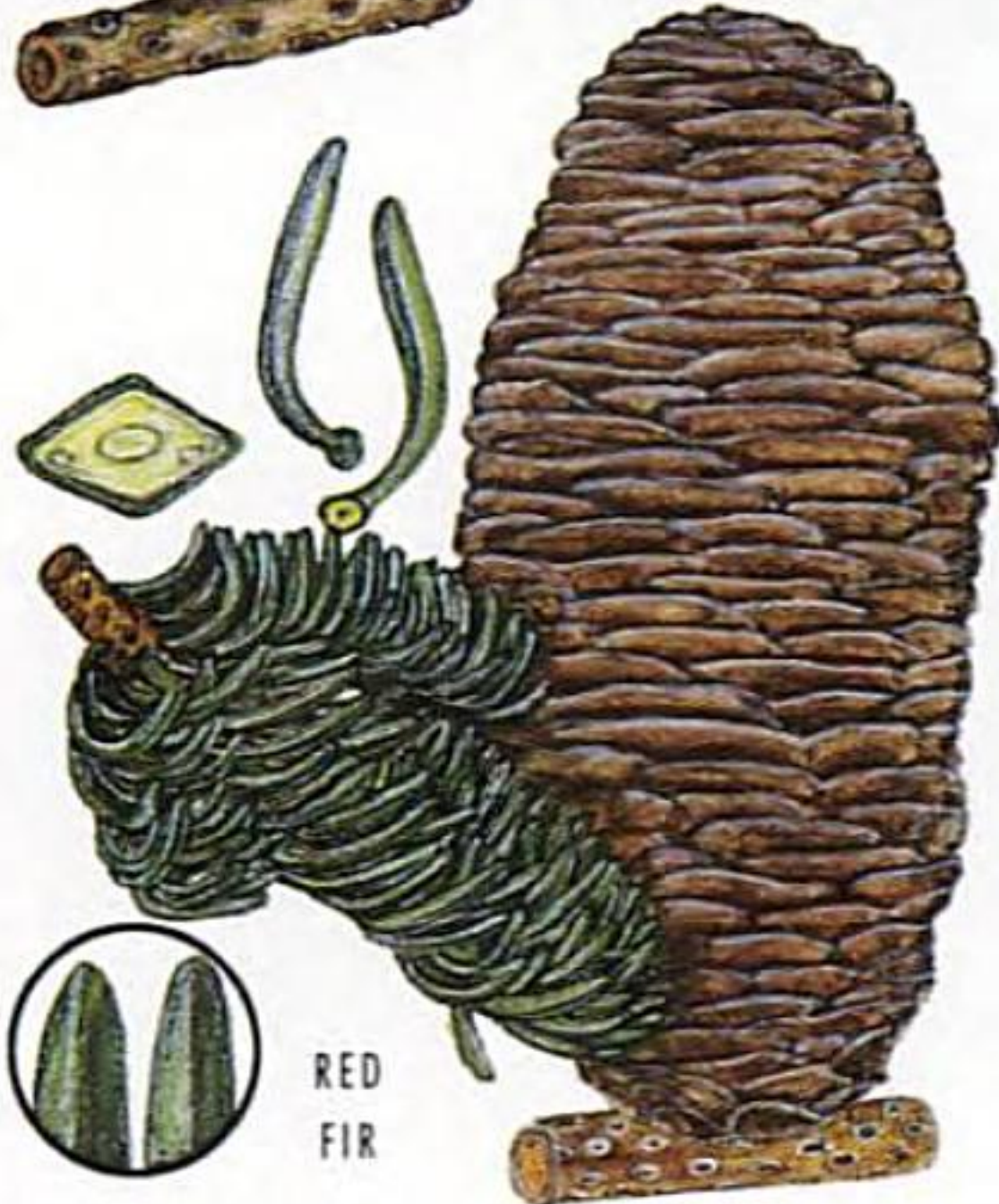
WHITE  
FIR



SILVER  
FIR



NOBLE  
FIR



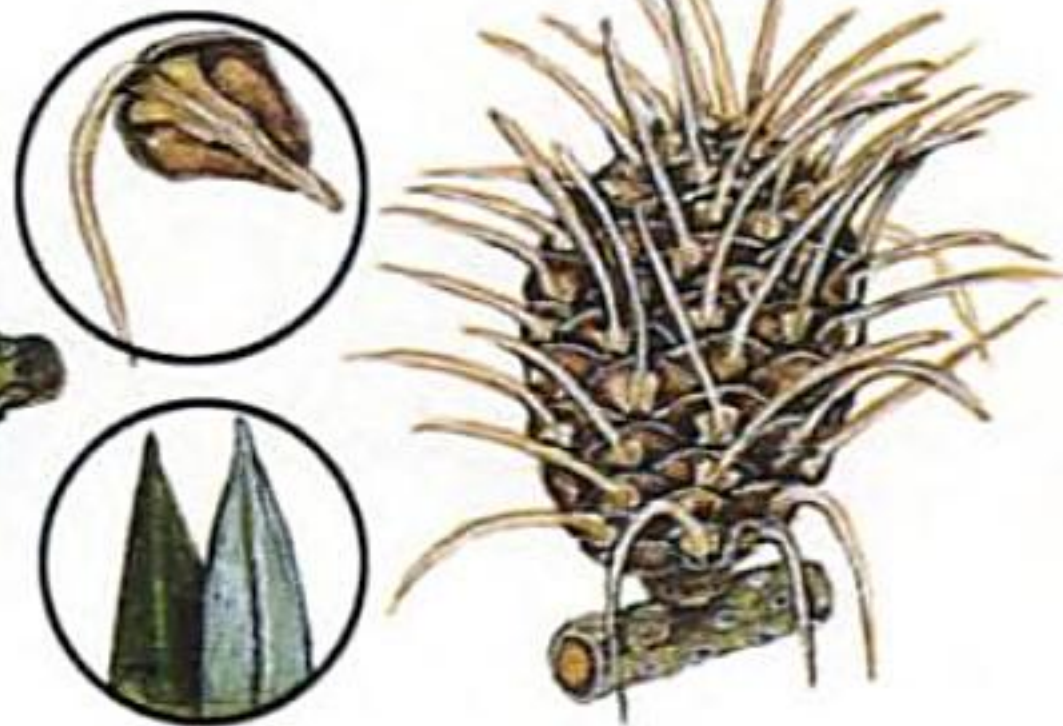
RED  
FIR



SUBALPINE  
FIR



BRISTLECONE FIR





OTHER CONIFERS WITH SINGLE FLAT NEEDLES

Trees evergreen, except Baldcypress. Foliage in flat sprays, except Mountain Hemlock. Douglas-fir needles leave circular scars on twigs like true firs of Pl. 7. Hemlock twigs have weak woody needle-pegs;<sup>1</sup> top shoot droops. Cones brown but fruits red, berrylike in Pacific Yew and green, olivelike in California Torreya.

SPECIES AND REMARKS

	Major distribution <sup>2</sup>	Needles on thin stalks <sup>3</sup>	Needles white-banded beneath <sup>3</sup>	Needle bases extend on twig <sup>3</sup>	Needle length (in.)	Cones/fruit length <sup>4</sup>	Cone scales with thick tips <sup>5</sup>	Text page
<b>COMMON DOUGLAS-FIR</b> <i>Pseudotsuga menziesii</i> 3-point cone bracts, twigs droop.	PR	+	+	-	¾-1½	L	-	159
<b>(BIGCONE DOUGLAS-FIR</b> <i>Pseudotsuga macrocarpa</i> ) Twigs droop, cones/bracts larger; sw. Calif.	P	+	+	-	¾-1½	VL	-	160
<b>WESTERN HEMLOCK</b> <i>Tsuga heterophylla</i> Needles of several lengths.	PR	+	+	-	¼-¾	S	-	160
<b>MOUNTAIN HEMLOCK</b> <i>Tsuga mertensiana</i> Needles not in flat sprays.	PR	+	+	-	¼-¾	L	-	162
<b>CALIFORNIA TORREYA</b> <i>Torreya californica</i> <sup>6, 7</sup> Needles stiff, spiny, scented.	P	+	+	+	1-3	M	O	163
<b>PACIFIC YEW</b> <i>Taxus brevifolia</i> <sup>6</sup> Needles soft, odorless.	PR	+	-	+	½-1	VS	O	164
<b>REDWOOD</b> <i>Sequoia sempervirens</i> <sup>7, 8</sup> Coastal fog belt, cen. Calif./sw. Ore.	P	-	+	+	½-1¼	S	+	165
<b>BALDCYPRESS</b> <i>Taxodium distichum</i> Deciduous; west to cen., s. Texas.	E	-	-	+	¼-¾	S	+	166

<sup>1</sup> See spruces, Pl. 6.  
<sup>2</sup> E = se. U.S., P = Pacific states and B.C., R = Rocky Mts., T = Texas.  
<sup>3</sup> Use lens. White bands may be lost on dried or weathered needles.  
<sup>4</sup> VS = very short, ⅜-½ in.; S = short, ¾-1 in.; M = medium, 1-1½ in.; L = long, 1½-3 in.; VL = very long, 4-7 in.  
<sup>5</sup> O = fruits fleshy, not dry cones.  
<sup>6</sup> Mendocino Co., coastal n. Calif., may be the only area where the ranges of these two species overlap.  
<sup>7</sup> Stump sprouts common.  
<sup>8</sup> High needles awl-shaped.



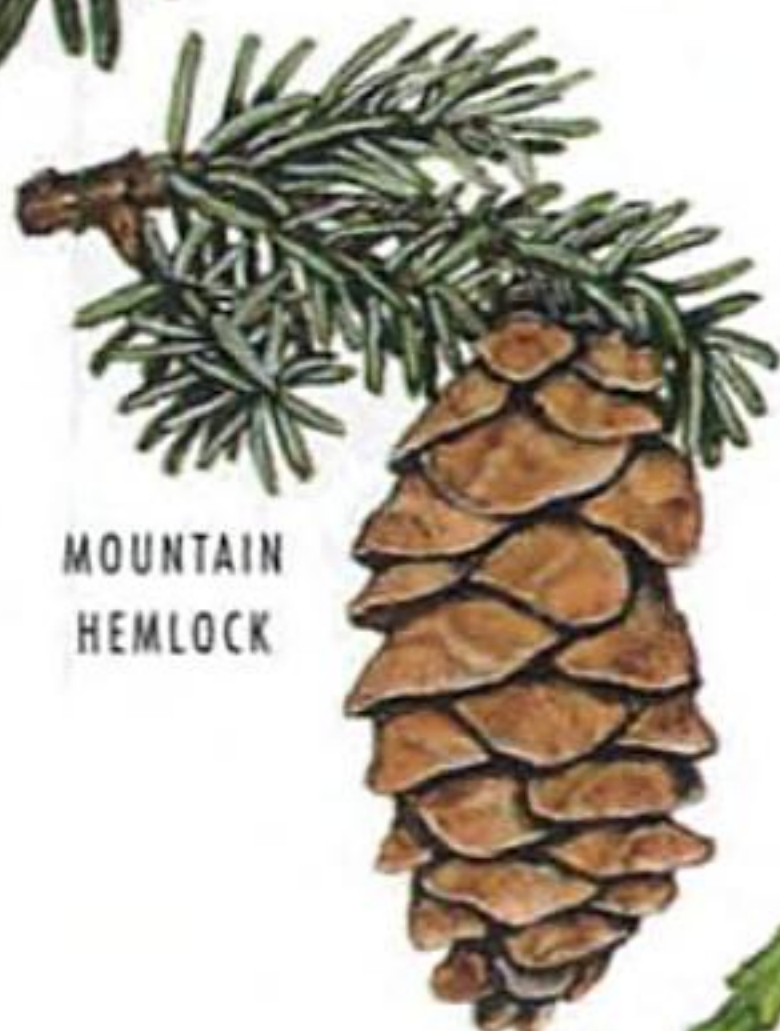




COMMON  
DOUGLAS-FIR



WESTERN HEMLOCK



MOUNTAIN  
HEMLOCK



CALIFORNIA  
TORREYA



PACIFIC YEW



REDWOOD

lower



BALDCYPRESS



# CONIFERS WITH SMALL SCALELIKE LEAVES: "CEDARS" AND CYPRESSES

Leaves mostly under  $\frac{1}{4}$  in., pairs alternate at right angles (use lens). Cones woody, brown, scales mostly 6–8. Cypress twigs often 4-angled. Trunks mostly furrowed and shreddy. For true cedars, see p. 124.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Foliage in flat sprays	Leaves with a gland dot <sup>3</sup>	Cone length (in.)	Text page
<b>INCENSE-CEDAR</b> <i>Calocedrus decurrens</i> Leaf-scales vase-shaped. <sup>2</sup>	P	+	—	$\frac{3}{4}$ –1	168
<b>WESTERN REDCEDAR</b> <i>Thuja plicata</i> <sup>2, 3, 4</sup> Scales "butterfly"-marked, sprays droop.	PR	+	±	$\frac{1}{2}$ – $\frac{3}{4}$	169
<b>ALASKA-CEDAR</b> <i>Chamaecyparis nootkatensis</i> Scales not marked, point out; sprays droop. <sup>2</sup>	P	+	—	$\frac{3}{8}$ – $\frac{1}{2}$	170
<b>PORT ORFORD-CEDAR</b> <i>Chamaecyparis lawsoniana</i> Scales X-marked, twigs slender. <sup>2, 3</sup>	on	+	+	$\frac{1}{4}$ – $\frac{3}{8}$	171
<b>ARIZONA CYPRESS</b> <i>Cupressus arizonica</i> Twigs thin, wide-angled.	S	—	+	$\frac{3}{4}$ –1 $\frac{1}{4}$	173
CYPRESSES NATIVE TO RESTRICTED AREAS IN CALIFORNIA/SW. OREGON <sup>5</sup>					
<b>(TECATE<sup>6</sup> CYPRESS</b> <i>Cupressus guadalupensis</i> ) Trunk red-brown, smooth, peeling.	sc	—	+	$\frac{3}{4}$ –1 $\frac{1}{4}$	174
<b>(MODOC CYPRESS</b> <i>C. bakeri</i> ) Cone scales warty.	on	—	+	$\frac{3}{8}$ – $\frac{3}{4}$	174
<b>(MACNAB CYPRESS</b> <i>C. macnabiana</i> ) Cone scales with prominent "horns."	n	+	+	$\frac{1}{2}$ –1	174
<b>(GOWEN CYPRESS</b> <i>C. goveniana</i> )	cn	—	—	$\frac{1}{2}$ – $\frac{3}{4}$	174
<b>(SARGENT CYPRESS</b> <i>C. sargentii</i> )	cn	—	+	$\frac{3}{4}$ –1	175
<b>(MONTEREY CYPRESS</b> <i>C. macrocarpa</i> <sup>2</sup> )	cn	—	—	1–1 $\frac{1}{2}$	175

<sup>1</sup> P = Pacific states and B.C., R = Rocky Mts.; S = Southwest; T = Texas. In Calif./Ore.: cn = cen./n. coasts; on = sw. Ore./nw. Calif.; n = n. Calif.; sc = sw. Calif.

<sup>2</sup> Cone scales: Incense-cedar, 6; Western Redcedar, 8–12; Alaska-cedar, 4–6; Port Orford-cedar and most cypresses, 6–8; Monterey Cypress, 8–14.

<sup>3</sup> Use lens to check for glands and white markings on undersides of fresh leaf-scales.

<sup>4</sup> Native coastal s. Alaska to n. Calif., also n. Rockies.

<sup>5</sup> May be planted elsewhere.

<sup>6</sup> teh-KAH-tay.









# TREES WITH SCALELIKE AND/OR AWL-SHAPED LEAVES: JUNIPERS, GIANT SEQUOIA, TAMARISK

Junipers: Leaf scales to  $\frac{1}{8}$  in.; twigs mostly  $\frac{1}{16}$  in. wide; fruits fleshy, round, mostly white-powdered; trunks mainly reddish, shreddy. Common Juniper on p. 183. Giant Sequoia: Needles sharp, to  $\frac{1}{2}$  in. long; cones woody, brown; mature trees huge. Tamarisks: Leaves tiny, scaly, deciduous; true flowers present, not a conifer. See Redshank, p. 186.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Color of mature fruits <sup>2</sup>	Fruits over $\frac{3}{8}$ in. diameter	Leaf scales with gland dot <sup>3</sup>	Leaf scales long-pointed <sup>3</sup>	Leaves: shade of green <sup>4</sup>	Trunk single	Seeds per fruit	Text page
<b>ROCKY MOUNTAIN JUNIPER</b> <i>Juniperus scopulorum</i> Twigs thin ( $\frac{1}{32}$ in.), droop.	W	B	-	+	+	D	+	2	177
<b>WESTERN JUNIPER</b> <i>J. occidentalis</i> Sierras and Cascades.	P	B	-	+	-	G	+	2-3	178
<b>ONESEED JUNIPER</b> <i>J. monosperma</i> Southern Rockies.	S	B	-	-	+	G	-	1	179
<b>UTAH JUNIPER</b> <i>J. osteosperma</i> Mature fruits red.	B	BR	±	-	-	Y	±	1-2	180
<b>(CALIFORNIA JUNIPER</b> <i>J. californica</i> ) Mostly west of Sierras.	P	R	+	+	-	Y	-	2	181
<b>(ALLIGATOR JUNIPER</b> <i>J. deppeana</i> ) Trunk bark thick, small squares.	S	R	+	+	+	B	+	4	181
<b>(PINCHOT JUNIPER</b> <i>J. pinchotii</i> ) Bark furrowed, West Texas.	T	R	-	+	±	Y	-	1-2	182
<b>(ASHE JUNIPER</b> <i>J. ashei</i> ) Bark shreddy, cen. Texas.	T	B	±	±	±	D	-	1-2	182
<b>(WEeping JUNIPER</b> <i>J. flaccida</i> ) Twigs pendent.	T	R	+	+	+	Y	±	4-12	183
<b>(EASTERN REDCEDAR</b> <i>J. virginiana</i> ) West to plains states.	E	B	-	±	+	Y	+	1-2	183
<b>GIANT SEQUOIA</b> <i>Sequoiadendron giganteum</i> Leaf bases extend along twig.	P	R	+	-	O	B	+	many	184
<b>FIVE-STAMEN TAMARISK</b> <i>Tamarix chinensis</i> Flowers pink, twigs thin; imported.	W	R	-	-	+	Y	+	many	185

<sup>1</sup> B = Great Basin, E = eastern U.S., P = Pacific states, S = sw. states, T = Texas and nearby, W = widespread.

<sup>2</sup> B = blue to blue-black, juicy; R = red-brown, dry.

<sup>3</sup> Use lens; o = all leaves awl-shaped, sharp.

<sup>4</sup> B = bluish-, D = dark-, G = gray-, Y = yellow-green.





ROCKY MOUNTAIN  
JUNIPER



WESTERN  
JUNIPER



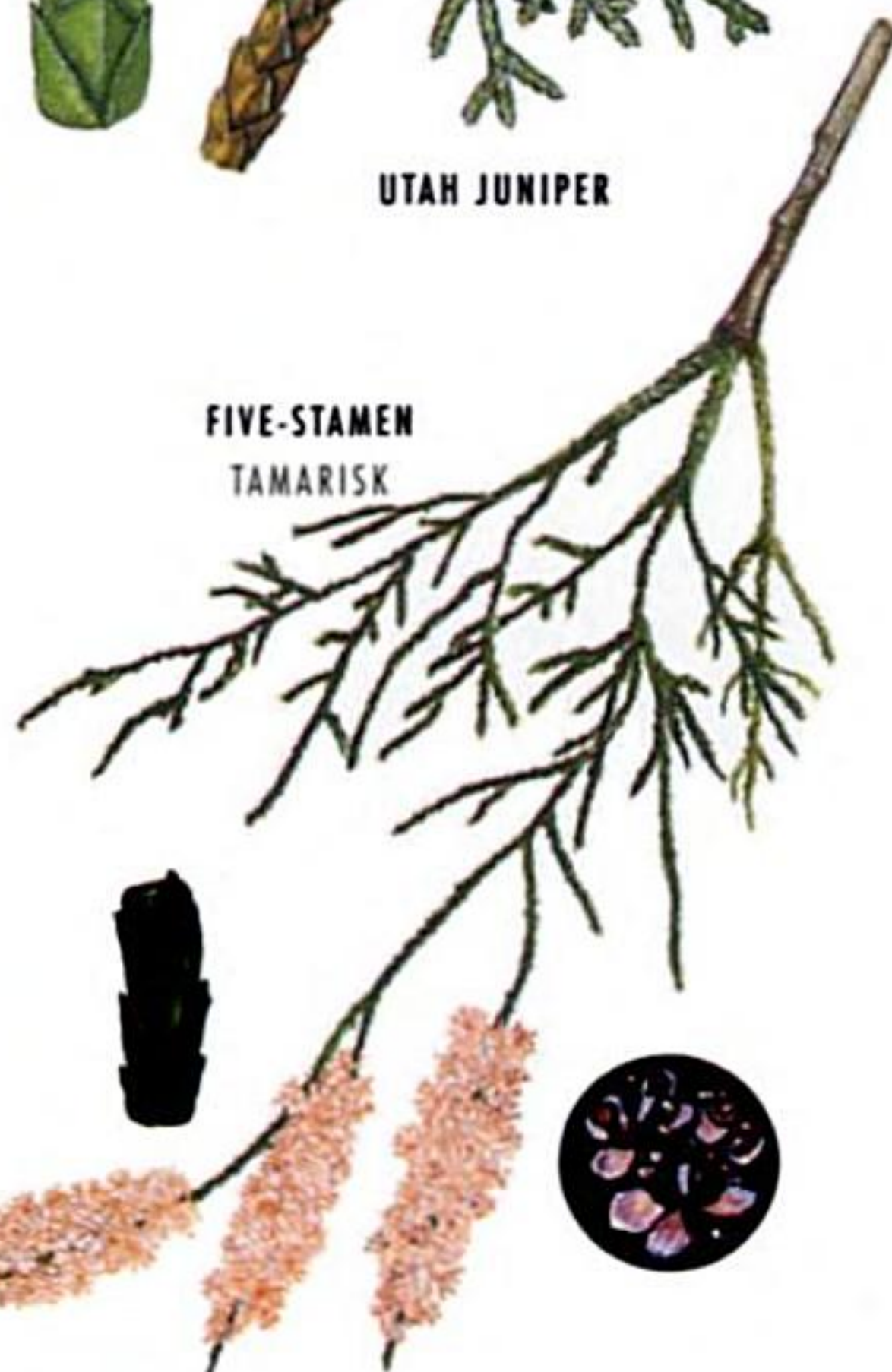
ONESEED JUNIPER



UTAH JUNIPER



GIANT  
SEQUOIA



FIVE-STAMEN  
TAMARISK





TREES WITH OPPOSITE LEAVES FAN-COMPOUND  
OR TRIFOLIATE

Buckeyes have 5–9 leaflets arranged like the spokes of a wheel, end buds large, flower clusters showy, upright. Sierra Bladdernut and Barreta have only 3 leaflets per leaf. Several ashes and maples plus an elderberry and Fernleaf Lyontree also sometimes have trifoliate leaves.

## SPECIES AND REMARKS


	Major distribution <sup>1</sup>	Leaflets per leaf	Leaflets stalked	Buds sticky	Flower color <sup>2</sup>	Fruit type <sup>3</sup>	Text page
<b>CALIFORNIA BUCKEYE</b> <i>Aesculus californica</i> The only wild buckeye in Calif.	P	5–7	+	+	P	N	188
<b>TEXAS BUCKEYE</b> <i>Aesculus glabra</i> <sup>4</sup> Leaflets 4–6 in. long; cen. Texas.	T	7–11	–	–	Y	N	189
<b>RED BUCKEYE</b> <i>Aesculus pavia</i> Leaflets 1 1/4–4 in. long; to cen. Texas.	E	5	±	–	RY	N	190
<b>HORSECHESTNUT</b> <i>Aesculus hippocastanum</i> <sup>4</sup> Leaflets 4–10 in. long; planted widely.	I	7–9	–	+	W	N	190
<b>SIERRA BLADDERNUT</b> <i>Staphylea bolanderi</i> Tiny leaflet tips; n./cen. Sierra.	P	3	+	–	W	I	190
<b>BARRETA</b> <i>Helietta parvifolia</i> Leaflets blunt, no teeth; s. Texas.	T	3	–	–	G	D	191
<b>(ASHES</b> <i>Fraxinus</i> spp., Pls. 12, 13) Fruits single-winged.	w	3–7	±	–	V	D	192
<b>(MAPLES</b> <i>Acer negundo</i> , Pl. 14; <i>A. glabrum</i> , Pl. 15) Fruits 2-winged.	w	3–5	+	–	G	D	205
<b>(MEXICAN ELDERBERRY</b> <i>Sambucus mexicana</i> ) See Pl. 14.	PS	3–5	+	–	W	B	202
<b>(FERNLEAF LYONTREE</b> <i>Lyonothamnus floribundus</i> ) <sup>5</sup> Leaves scalloped; s. Calif. islands.	P	2–7	–	–	W	D	198

<sup>1</sup> E = eastern U.S.; I = introduced from abroad; P = Pacific area; S = Southwest; T = Texas; w = widespread.

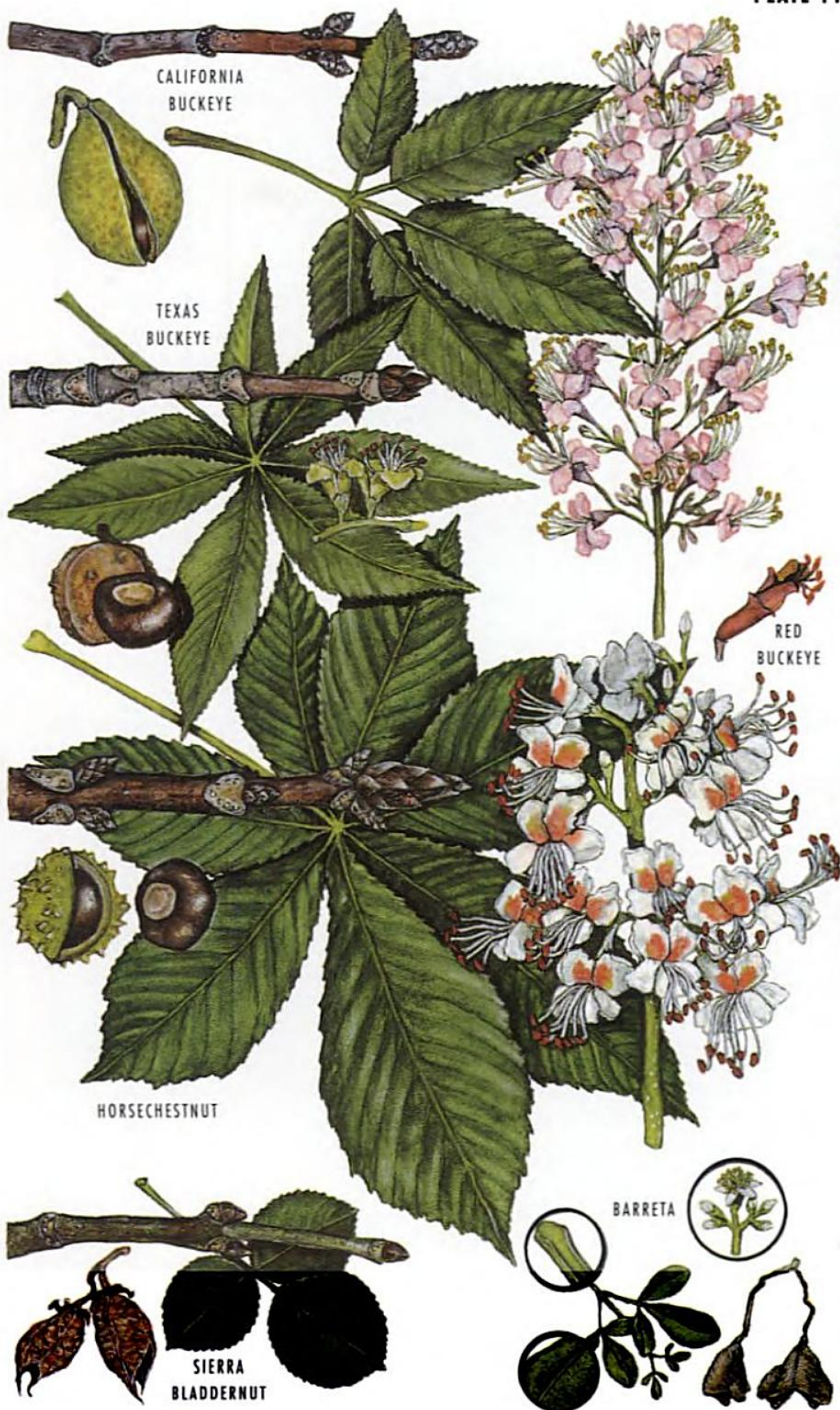
<sup>2</sup> G = greenish white, P = pinkish white, R = red, W = white, Y = yellow, V = variable.

<sup>3</sup> B = blue, fleshy; D = dry, see text; I = inflated, balloonlike, 1–2 in. long; N = large nut in thick husk.

<sup>4</sup> Nut husk prickly; Horsechestnut is a European tree.

 <sup>5</sup> var. *asplenifolius*, Pl. 14.







TREES WITH OPPOSITE LEAVES  
FEATHER-COMPOUND: ASHES I

Ashes of the Pacific states and Ariz.  
Leaves mostly 5–12 in. long; leaflets  
3–9 (mostly 5–7), toothed or not.  
Flowers mostly small, clustered, dark,  
mostly without petals. Fruits dry, single-  
winged, mostly blunt-tipped. These  
ashes mostly with seed flattened. See  
also Pl. 13 and Singleleaf Ash, Pl. 16.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaflets long-pointed <sup>2</sup>	Leaflet length <sup>3</sup>	Leaflets always toothed	Leaflet stalks under 1/16 in.	Fruits winged to base	Fruit length <sup>5</sup>	Text page
<b>OREGON ASH</b> <i>Fraxinus latifolia</i> Leaves ± hairy; Pacific N.W./Calif.	P	—	L	—	+	—	L	192
<b>TWO-PETAL ASH</b> <i>F. dipetala</i> <sup>6</sup> Petals 2, white, 1/8 in. wide.	P	—	M	+	—	+	M	193
<b>(FRAGRANT ASH</b> <i>F. cuspidata</i> ) Petals 4, white, 1/32 in. wide; Pl. 13.	S	+	M	—	—	+	M	196
<b>VELVET ASH</b> <i>F. velutina</i> <sup>4</sup> Leaves ± hairy; s. Calif./ sw. Utah/w. Texas.	PT	±	M	+	—	—	M	194
<b>(CHIHUAHUA<sup>7</sup> ASH</b> <i>F. papillosa</i> ) Leaflets whitish beneath; Pl. 13.	S	—	M	—	+	—	M	197
<b>LOWELL ASH</b> <i>F. lowellii</i> <sup>6</sup> Twigs 4-lined; n. Ariz.	S	—	M	+	±	+	M	194
<b>GOODDING ASH</b> <i>F. gooddingii</i> <sup>8</sup> Leaves 1–3 1/4 in.	S	—	S	+	+	±	S	196

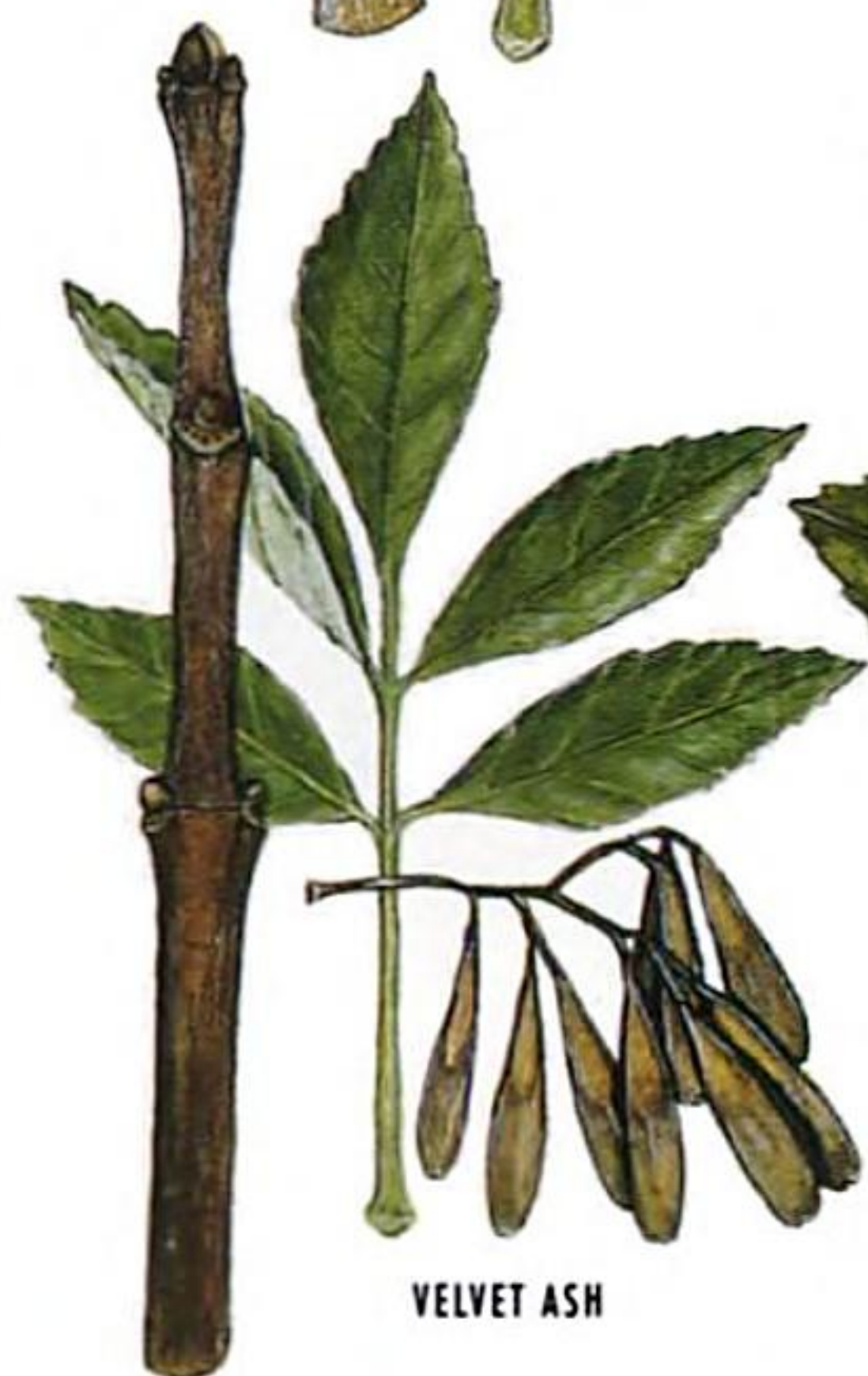
<sup>1</sup> P = Pacific states, S = Southwest, T = Texas.  
<sup>2</sup> — = tips short-pointed.  
<sup>3</sup> L = long, 3–5 in.; M = medium, 1–3 in.; S = short, 3/8–1 in.  
<sup>4</sup> Seeds swollen, plump, not flattened.  
<sup>5</sup> L = long, 1–2 in.; M = medium, 1/4–1 1/4 in.; S = short, 1/4–1 in.  
<sup>6</sup> Twigs ± 4-lined or 4-angled.  
<sup>7</sup> chee-WAH-wah.  
<sup>8</sup> Evergreen; leafstalk and midrib winged (use lens), se. Ariz.







TWO-PETAL  
ASH



LOWELL  
ASH



GOODDING  
ASH





TREES WITH OPPOSITE LEAVES  
FEATHER-COMPOUND: ASHES II

Ashes of the Mexican border region (Ariz. to Texas) and Great Plains. Leaves mostly 5–12 in. long; leaflets 3–9 (mostly 5–7), toothed or not. Flowers mostly small, clustered, dark, without petals. Fruits dry, single-winged, mostly blunt-tipped. See also Pl. 12 and Singleleaf Ash, Pl. 16.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaflets long-pointed <sup>2</sup>	Leaflet length <sup>3</sup>	Leaflets always toothed	Leaflet stalks under 1/4 in.	Fruits winged to base	Fruit length <sup>5</sup>	Text page
(VELVET ASH <i>Fraxinus velutina</i> , Pl. 12) Leaves ± hairy; s. Calif. to w. Texas.	PT	±	M	+	–	–	M	194
FRAGRANT ASH <i>F. cuspidata</i> <sup>4</sup> Petals white, 1/32 in. wide.	S	+	M	–	–	+	M	196
CHIHUAHUA ASH <i>F. papillosa</i> <sup>4, 6</sup> Leaflets whitish beneath.	S	–	M	–	+	–	M	197
(GOODDING ASH <i>F. gooddingii</i> ) <sup>4, 7</sup> Leaflets 1–3 1/4 in., tips pointed, se. Ariz.; Pl. 12.	S	–	S	+	+	±	S	196
GREGG ASH <i>F. greggii</i> <sup>7</sup> Leaflets 1/2–1 1/4 in., tips blunt; w. Texas.	T	–	S	–	+	–	S	197
TEXAS ASH <i>F. texensis</i> Leaflets 1–3 in. long; s. Okla./cen. Texas.	T	–	M	+	–	–	M	197
BERLANDIER ASH <i>F. berlandierana</i> Leaflets 3–4 in. long; s./cen. Texas.	T	+	L	–	–	±	M	198
GREEN ASH <i>F. pennsylvanica</i> <sup>8</sup> Leaflets 4–6 in.; plains, Alta. to Texas.	E	+	L	–	±	–	L	198

<sup>1</sup> E = e. U.S. to Great Plains, P = Pacific area, S = Southwest, T = Texas.  
<sup>2</sup> – = tips short-pointed.  
<sup>3</sup> L = long, 3–6 in.; M = medium, 1–3 in.; S = short, under 1 in.  
<sup>4</sup> Seeds somewhat flattened, not plump.  
<sup>5</sup> L = long, 1–2 in.; M = medium, 3/4–1 1/4 in.; S = short, 1/2–1 in.  
<sup>6</sup> chee-WAH-wah.  
<sup>7</sup> Leafstalk and midrib winged (use lens).  
<sup>8</sup> Leaflet stalks winged.

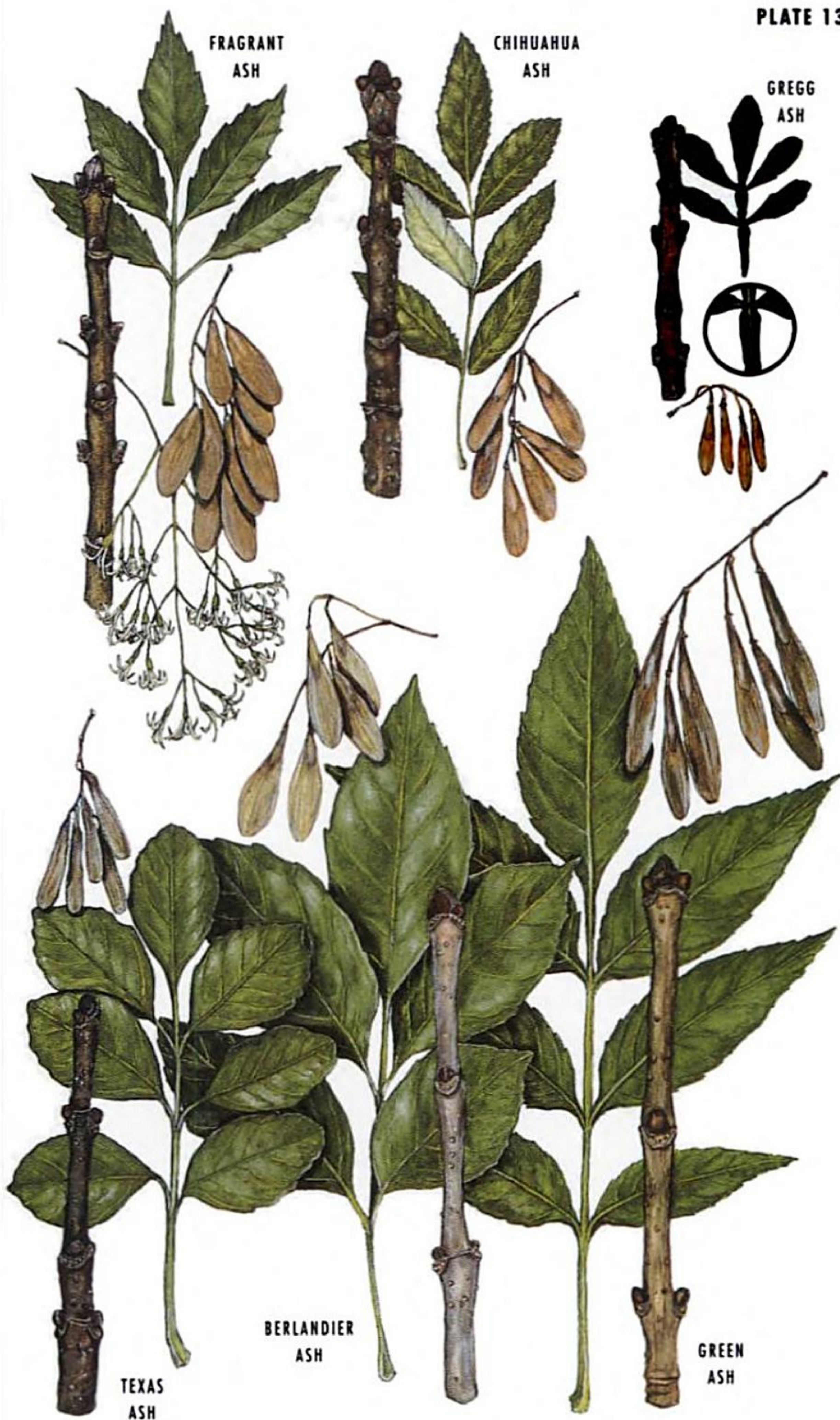




FRAGRANT  
ASH

CHIHUAHUA  
ASH

GREGG  
ASH





ELDERBERRIES AND OTHER TREES WITH  
OPPOSITE FEATHER-COMPOUND LEAVES

Leaflets 3–16, mostly toothed;<sup>1</sup> twigs mostly ringed at nodes, hairless. Elderberries have pith large, mostly white; flower/fruit clusters mostly flat-topped; flowers white; fruits mostly fleshy, small.

SPECIES AND REMARKS

	Major distribution <sup>2</sup>	Leaflets per leaf	Leaflet bases uneven	Leaflet stalks under 1/16 in.	Leaflets hairy beneath	Fruit color and type <sup>3</sup>	Text page
<b>FERNLEAF LYONTREE</b> <i>Lyonothamnus floribundus</i> <sup>1</sup> Evergreen, bark shreddy.	P	3–7	±	+	±	D	198
<b>ASHLEAF MAPLE</b> <i>Acer negundo</i> Leaf scars meet at raised points.	w	3–5	–	–	–	G	199
<b>RED ELDERBERRY</b> <i>Sambucus racemosa</i> Leaflets 2–6 in., pith brown, flower clusters cone-shaped.	P	5–7	±	±	–	R	201
<b>BLUE ELDERBERRY</b> <i>Sambucus caerulea</i> Leaflets 2–6 in., pith white/brown, flower clusters flat.	w	5–9	+	–	–	U	201
<b>VELVET ELDERBERRY</b> <i>Sambucus velutina</i> Leaflets 1–1 1/2 in., velvet-hairy, pith white; mostly Calif., 3000–8000 ft.	P	3–5	+	+	+	UK	202
<b>MEXICAN ELDERBERRY</b> <i>Sambucus mexicana</i> Leaflets 1–1 1/2 in., hairless, pith brownish; n. Calif. to sw. N.M., to 4000 ft.	PS	3–5	±	+	–	K	202
<b>COMMON ELDERBERRY</b> <i>Sambucus canadensis</i> Leaflets 2 1/2–5 in., west to w. Kansas and nw./s. Texas; pith white.	E	5–11	–	±	±	K	203
<b>TEXAS LIGNUMVITAE</b> <i>Guaiacum angustifolium</i> No end leaflet, tiny leaflets fold.	T	8–16	+	+	–	D	203

<sup>1</sup> Fernleaf Lyontree (var. *asplenifolius*) leaflets are variously described as toothed or lobed; note simple leaves of Santa Catalina I. variety (see Pl. 16).  
<sup>2</sup> E = e. U.S., P = Pacific states and B.C., S = Southwest, T = Texas, w = widespread.  
<sup>3</sup> D = dry, brownish capsules; G = green, paired maple keys; K = black, juicy; R = red, juicy; U = blue, juicy.





(CATALINA LYONTREE)



FERNLEAF  
LYONTREE



ASHLEAF MAPLE

II



COMMON  
ELDERBERRY



RED  
ELDER-  
BERRY



BLUE  
ELDER-  
BERRY



VILEVET  
ELDER-  
BERRY



MEXICAN  
ELDER-  
BERRY



TEXAS



TREES WITH OPPOSITE SIMPLE LEAVES LOBED:  
MAPLES

The only U.S. trees with such foliage. Leaves of Western Mountain and Canyon maples may be in 3 leaflets (see Pl. 11). First 5 species: buds mostly red and pointed; flower clusters mostly pendent, fruits mostly forming U- and V-shaped pairs. Ash-leaf Maple (Pl. 14) has compound leaves. Last 4 species: buds blunt.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length (in.)	Leaf lobes	Leaf teeth sharp	Bud scales only two	Flower/fruit cluster slim <sup>2</sup>	Single fruit length (in.)	Text page
<b>BIGLEAF MAPLE</b> <i>Acer macrophyllum</i> Leafstalks 8–12 in., milky sap.	P	16–24	5	–	–	+	1½–2	206
<b>WESTERN MOUNTAIN MAPLE</b> <i>A. glabrum</i> Twigs hairless; north to s. Alaska.	w	4–7	3–5	+	+	–	¾–1	206
<b>(EASTERN MOUNTAIN MAPLE</b> <i>A. spicatum</i> ) Twigs ± fine-hairy, flower cluster erect.	C	4–10	3–5	+	+	+	½–¾	207
<b>CANYON MAPLE</b> <i>A. grandidentatum</i> Bud scales 4; Idaho to Texas/Okla.	R	2–4½	3–5	–	–	–	½–1	207
<b>VINE MAPLE</b> <i>A. circinatum</i> Leaves circular, fruit pairs horizontal.	P	3–6	7–9	+	±	–	½–¾	208
<b>PLANTED TREES FROM EASTERN U.S. AND EUROPE (see p. 208)</b>								
<b>(NORWAY MAPLE</b> <i>A. platanoides</i> ) <sup>3</sup> Leafstalk sap milky.	I	5–9	5–7	+	–	–	1½–2	208
<b>(SYCAMORE MAPLE</b> <i>A. pseudoplatanus</i> ) <sup>3</sup> Leafstalk sap clear.	I	5–9	5	–	–	+	2–4	208
<b>(SILVER MAPLE</b> <i>A. saccharinum</i> ) <sup>4</sup> Leaf lobes deep; base of end lobe narrow.	I	4–8	5	+	–	–	1½–3	208
<b>(RED MAPLE</b> <i>A. rubrum</i> ) <sup>4</sup> Leaf lobes shallow, base of end lobe wide.	I	4–8	3–5	+	–	–	½–1	208

<sup>1</sup> C = Canada, Sask. and East; I = foreign, introduced; P = Pacific states and B.C.; R = Rocky Mts.; w = widespread.

<sup>2</sup> Flowers/fruits in finger-shaped cluster along central, mainly unbranched axis.

<sup>3</sup> Buds green.

<sup>4</sup> Leaves whitish below.







BIGLEAF  
MAPLE

CANYON  
MAPLE

VINE MAPLE

WESTERN MOUNTAIN MAPLE



TREES WITH OPPOSITE SIMPLE LEAVES TOOTHED  
OR WAVY-EDGED

A miscellaneous group, mostly with shiny leaves 2–7 in. long. Some with 4-sided twigs. Leaf tips mostly pointed. These viburnums have winged leaf-stalks. Pacific Dogwood (Pl. 17) has leaves sometimes toothed. Camphor-tree (Pl. 30), Cascara Buckthorn (Pl. 43), and California Buckthorn (Pl. 45) may have some leaves opposite.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf edge type <sup>2</sup>	Twigs 4-lined	Flowers <sup>3</sup>	Fruits <sup>4</sup>	Text page
<b>WAVYLEAF SILKTASSEL</b> <i>Garrya elliptica</i> <sup>5</sup> Leaves woolly; coastal, cen. Ore./s. Calif.	P	W	+	C	H	209
<b>WESTERN BURNINGBUSH</b> <i>Euonymus occidentalis</i> Twigs green; coastal mountains.	P	T	+	P	D	209
<b>(CATALINA LYONTREE</b> <i>Lyonothamnus floribundus</i> <sup>5</sup> ) Simple-leaf form, Santa Catalina I., illus. on Pl. 14.	P	TS	—	W	C	210
<b>SINGLELEAF ASH</b> <i>Fraxinus anomala</i> Leaves ± circular, 1–3 leaflets.	RS	TS	+	G	W	210
<b>NANNYBERRY</b> <i>Viburnum lentago</i> Buds long, slender, brown; west on Great Plains.	E	T	—	W	F	210
<b>RUSTY BLACKHAW</b> <i>Viburnum rufidulum</i> Midribs red-hairy, buds short.	T	T	—	W	F	211

<sup>1</sup> E = eastern species ranging west to Black Hills, S.D., P = Pacific states, R = s. Rocky Mtns., S = Southwest, T = Texas and se. U.S.

<sup>2</sup> S = smooth, without teeth; T = toothed; W = wavy-edged.

<sup>3</sup> C = catkinlike string of small flowers; G = greenish, small; P = purple, small; W = white, clusters nearly flat-topped.

<sup>4</sup> C = capsules, dry, in flat-topped clusters; D = dry capsule, opening to show fleshy red fruits; F = fleshy, dark, single-seeded clusters; H = white-hairy; W = winged, dry.

<sup>5</sup> Var. *floribundus* Gray.





WAVYLEAF SILKTASSEL



WESTERN BURNINGBUSH



SINGLELEAF  
ASH



NANNYBERRY



RUSTY BLACKHAW





TREES WITH OPPOSITE OR WHORLED  
SIMPLE LEAVES NOT TOOTHED

Dogwoods: Veins tend to follow leaf edges, twigs mostly red-purple, leaf scars raised, bundle scars 3, pith brown or white, flowers white or greenish and mostly in round or flat-topped clusters. Others: Not as above, bundle scars 1. See also Pl. 16. Species on Pls. 39, 45, and 46 have some leaves opposite.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Color of pith <sup>2</sup>	Bud scales two	Color of mature fruits <sup>2</sup>	Text page
<b>PACIFIC DOGWOOD</b> <i>Cornus nuttallii</i> Leaves ± hairy, <sup>3</sup> vein pairs 4–6, flowers showy, fruits stalkless. <sup>5</sup>	P	B	+	R	212
<b>SMOOTH DOGWOOD</b> <i>Cornus glabrata</i> Leaves smooth, vein pairs 3–4; coastal.	P	B	+	W	213
<b>WESTERN DOGWOOD</b> <i>Cornus occidentalis</i> Leaves ± hairy, vein pairs 4–7.	P	WB	+	W	214
<b>(BLACKFRUIT DOGWOOD</b> <i>Cornus sessilis</i> ) Vein pairs 4–5; n. Calif.	P	W	+	K	214
<b>RED-OSIER DOGWOOD</b> <i>Cornus stolonifera</i> Twigs bright red, vein pairs 4–7.	w	W	+	W	215
<b>ROUGHLEAF DOGWOOD</b> <i>Cornus drummondii</i> Sandpapery, vein pairs 3–4; s. plains.	TE	B	+	W	215
<b>DESERT-OLIVE FORESTIERA</b> <i>Forestiera phillyreoides</i> Leaves 5x width, edges rolled.	S	B	–	K	216
<b>(TEXAS FORESTIERA</b> <i>Forestiera angustifolia</i> ) Leaves 8x width; s. and w. Texas.	T	B	–	K	216
<b>SILVER BUFFALOBERRY</b> <i>Shepherdia argentea</i> Leaves/twigs silver-scaly, ± thorny.	w	B	+	R	217
<b>BUTTONBUSH</b> <i>Cephalanthus occidentalis</i> Leaves often in 3s–4s, buds embedded.	PT	B	±	D	217
<b>(CRAPEMYRTLE</b> <i>Lagerstroemia indica</i> ) Trunk yellow-green, mottled. <sup>4</sup>	PT	B	+	B	218
<b>(BLACK MANGROVE</b> <i>Avicennia germinans</i> ) Coastal, evergreen, erect breather roots.	T	W	+	G	218

<sup>1</sup> E = e. U.S.; I = introduced, planted; P = Pacific states and B.C.; S = s. Ariz.; T = Texas; w = widespread.

<sup>2</sup> B = brown; D = dry, ball-shaped; G = green; K = black; R = red; W = white.

<sup>3</sup> Leaves occasionally fine-toothed.

<sup>4</sup> Bark resembles that of Texas Persimmon.

<sup>5</sup> Other dogwoods have stalked flowers/fruits.







PACIFIC  
DOGWOOD



SMOOTH  
DOGWOOD



RED-OSIER  
DOGWOOD



WESTERN  
DOGWOOD



ROUGHLEAF  
DOGWOOD



DESERT-OLIVE  
FORESTIERA



SILVER  
BUFFALOBERRY



BUTTONBUSH





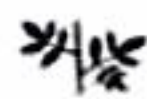
THORNY SOUTHWESTERN TREES WITH ALTERNATE  
ONCE-COMPOUND LEAVES

Southwestern trees plus Black Locust.  
Leaflets mostly under 2 inches long.  
Coralbean often leafless. Fruit pods  
beaded in first two species. Prickly-ash  
leaflets wavy-toothed. *Robinia* buds hid-  
den beneath leaf scars. Honey Locust  
may have some or all leaves once-  
compound. Several species evergreen<sup>3</sup>.  
Littleleaf Sumac (Pl. 23), though mostly  
thornless, has stiff thornlike twigs.  
Leaves of some species on Pls. 19–20  
may appear to be once-compound.

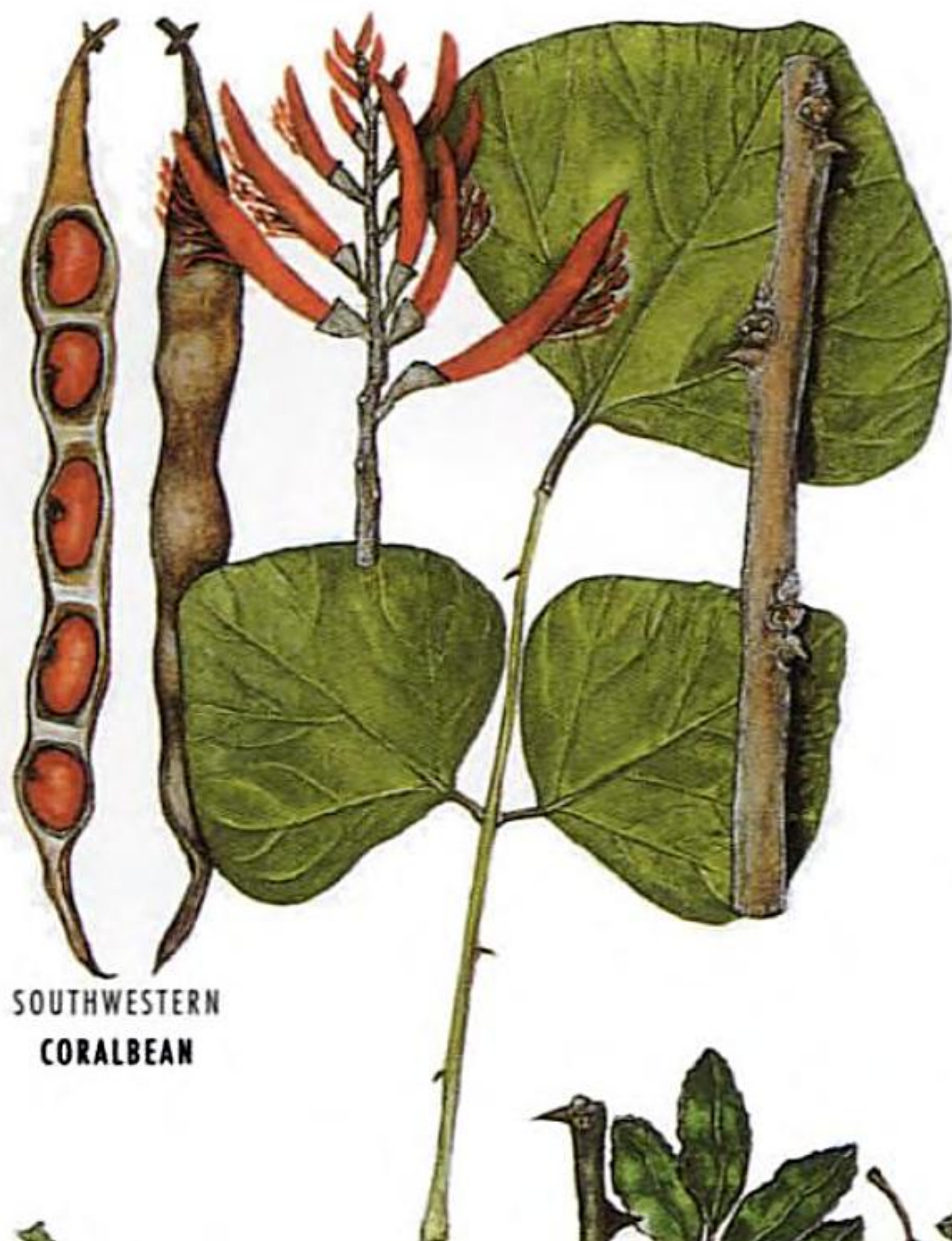
SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Thorns paired	Leafstalks thorny	Leaflets per leaf	Twigs hairy	Flower color <sup>2</sup>	Text page
<b>SOUTHWESTERN CORALBEAN</b> <i>Erythrina flabelliformis</i> Leaflets 2–4 in. long, triangular.	S	±	+	3	±	R	220
<b>DESERT IRONWOOD</b> <i>Olneya tesota</i> <sup>3</sup> Leaves dense, clustered, gray-green.	S	±	–	8–20	–	P	221
<b>LIME PRICKLY-ASH</b> <i>Zanthoxylum fagara</i> <sup>3</sup> Leaves thin, midribs winged.	T	±	–	5–11	–	G	222
<b>TEXAS PRICKLY-ASH</b> <i>Zanthoxylum hirsutum</i> <sup>3</sup> Leaves crinkled, leathery.	T	–	+	3–7	+	G	222
<b>(SOUTHERN PRICKLY-ASH</b> <i>Zanthoxylum clava-herculis</i> ) <sup>3</sup> Leaflet halves unequal.	TE	±	+	7–17	–	G	223
<b>NEW MEXICO LOCUST</b> <i>Robinia neomexicana</i> Leaflets with tiny bristle tips.	S	+	–	9–21	±	P	223
<b>BLACK LOCUST</b> <i>Robinia pseudoacacia</i> Escaped widely; no leaflet tips.	E	+	–	7–19	–	W	224
<b>(HONEY LOCUST</b> <i>Gleditsia triacanthos</i> ) Thorns 2–10 in. long; Pl. 20.	E	–	–	8–16	–	W	235

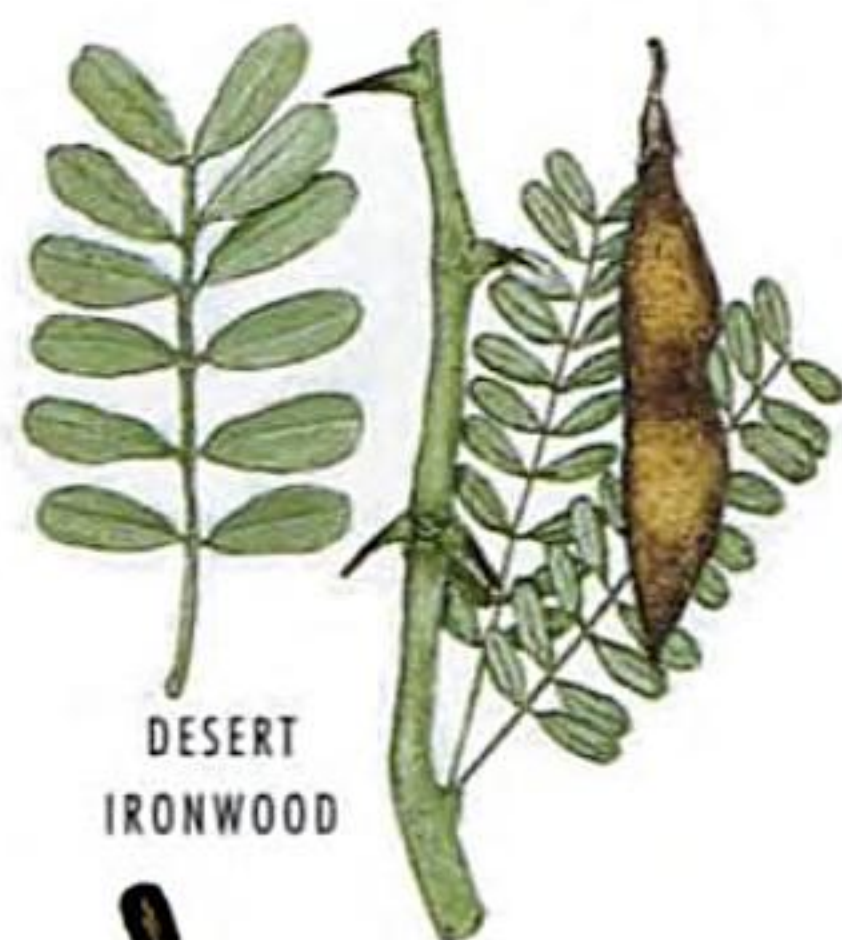
<sup>1</sup> E = e. U.S., planted in West; S = Southwest; T = Texas.  
<sup>2</sup> G = greenish, P = purplish, R = red, W = white.  
<sup>3</sup> Evergreen or nearly so; crushed leaves of prickly-ashes have a lemon odor.







SOUTHWESTERN  
CORALBEAN



DESERT  
IRONWOOD



LIME  
PRICKLY-ASH



TEXAS  
PRICKLY-  
ASH



NEW  
MEXICO  
LOCUST



BLACK LOCUST



SOUTHWESTERN TREES WITH ALTERNATE LEAVES  
TWICE-COMPOUND AND THORNS PAIRED

Pea-group plants with leaflets not toothed. Spur branches present (especially obvious in mesquites). Thorns straight or slightly curved; single or in 3s in Jerusalem-thorn. Roemer Catclaw (Pl. 20) and mesquites may have some single thorns. First 4 species evergreen.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Major leaflet pairs	Minor leaflet pairs per major	Minor leaflet width <sup>2</sup>	Flower clusters <sup>3</sup>	Fruit pod type <sup>4</sup>	Text page
<b>HUISACHE</b> <sup>5</sup> <i>Acacia farnesiana</i> Leaves 2–4 in. long, pods hairless.	PT	4–8	10–25	T	BY	C	225
<b>(HUISACHILLO)</b> <sup>6</sup> <i>Acacia tortuosa</i> Leaves 1–1 ½ in. long, pods hairy.	T	4–8	15–20	T	BY	C	226
<b>TENAZA</b> <sup>7</sup> <i>Pithecellobium pallens</i> Minor leaflets medium green, narrow.	T	4–6	8–20	N	BW	F	226
<b>TEXAS EBONY</b> <i>Pithecellobium flexicaule</i> Minor leaflets dark, wide.	T	1–3	3–6	M	SW	C	227
<b>HONEY MESQUITE</b> <sup>8</sup> <i>Prosopis glandulosa</i> <sup>9</sup> Leaflets hairless, ¾–1 ½ in. long.	ST	1	10–20	M	SY	C	228
<b>VELVET MESQUITE</b> <i>Prosopis velutina</i> <sup>9</sup> Leaflets hairy, ¼–½ in. long.	S	1	15–20	N	SY	C	229
<b>SCREWBEAN MESQUITE</b> <i>Prosopis pubescens</i> <sup>9</sup> Leaflets ± hairy, ¼–¾ in. long.	BT	1	5–9	M	SY	S	229
<b>JERUSALEM-THORN</b> <i>Parkinsonia aculeata</i> Midribs grasslike, leaflets fall.	ST	1–3	20–30	N	LY	B	229

<sup>1</sup> BT = Great Basin to Texas, PT = s. Calif. to Texas, S = Southwest, T = s. Texas.  
<sup>2</sup> T = thin, 1/32 in., N = narrow, 1/16 in., M = medium, 1/8–1/4 in.  
<sup>3</sup> B = ball-shaped, L = loose, S = slim spike, W = white, Y = yellow.  
<sup>4</sup> B = beaded, C = cylindrical, F = flat, S = spiraled.  
<sup>5</sup> weesah-chay.  
<sup>6</sup> weesah-CHEE-yoh; fruit pods slightly beaded.  
<sup>7</sup> ten-AH-za.  
<sup>8</sup> mes-KEET or, more properly, mes-keetay.  
<sup>9</sup> Major leaflet pairs rarely 2 (or 2–3 in Honey Mesquite).







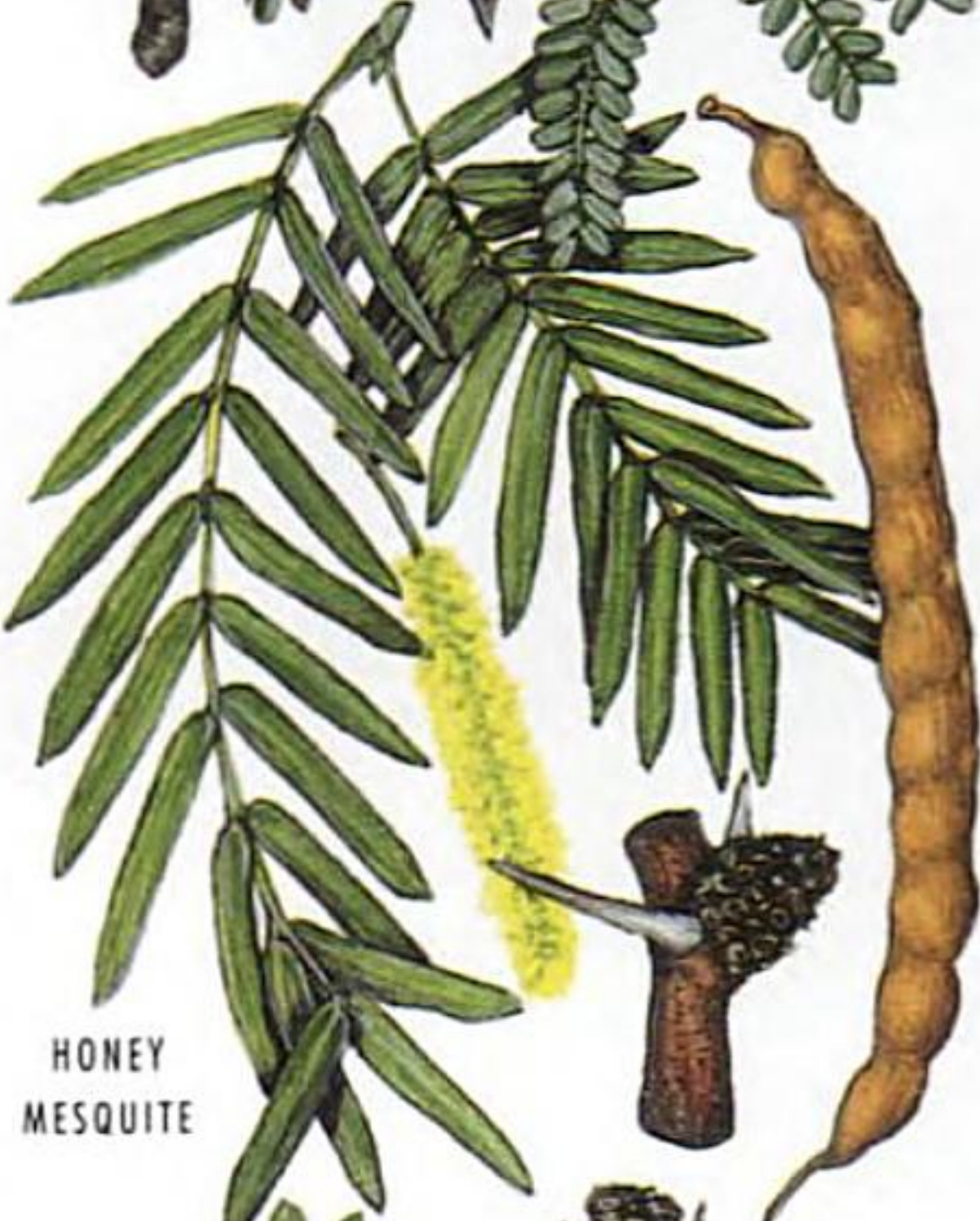
HUISACHE



TENAZA



TEXAS EBONY



HONEY MESQUITE



VELVET MESQUITE



SCREWBEAN MESQUITE



JERUSALEM-THORN

IV



# MOSTLY SOUTHWESTERN TREES WITH ALTERNATE LEAVES TWICE-COMPOUND AND THORNS SINGLE

More pea-family plants, mainly of the Mexican border and Southwest. Fruit pods flat. Paloverdes have tiny leaves present only briefly in spring (see Pl. 26). These acacias have single hooked thorns. All have leaves with no teeth, except some Honey Locusts. Jerusalem-thorn and mesquites (Pl. 19) may have some single thorns.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Thorn length <sup>2</sup>	Major leaflet pairs	Minor leaflet width <sup>3</sup>	Flower cluster <sup>4</sup>	Fruit pod length <sup>5</sup>	Text page
<b>BLUE PALOVERDE</b> <sup>6</sup> <i>Cercidium floridum</i> Trunk blue-green.	S	M	1	N	LY	±	231
<b>(YELLOW PALOVERDE</b> <sup>6</sup> <i>Cercidium microphyllum</i> ) Trunk yellow, twig tips spiny; Pl. 26.	S	L	1	N	LY	±	262
<b>TEXAS PALOVERDE</b> <sup>6</sup> <i>Cercidium texanum</i> Trunk gray-green.	T	M	1-3	M	LY	-	231
<b>GUAJILLO</b> <sup>7</sup> <i>Acacia berlandieri</i> Pods velvety, flat.	T	M	5-12	T	BW	+	232
<b>GREGG CATCLAW</b> <i>Acacia greggii</i> Pods hairless, twisted.	ST	M	1-3	N	SY	±	233
<b>ROEMER CATCLAW</b> <i>Acacia roemeriana</i> Pods hairless, flat.	T+	S	1-3	M	BW	±	233
<b>WRIGHT CATCLAW</b> <i>Acacia wrightii</i> Pods hairless, flat.	T	S	1-2	M	SY	±	234
<b>DWARF POINCIANA</b> <sup>8</sup> <i>Caesalpinia pulcherrima</i> Leaflets blunt, flowers red.	ST	M	5-10	W	LR	+	234
<b>HONEY LOCUST</b> <i>Gleditsia triacanthos</i> Thorns ± branched, leaves large, 6-15 in. long.	E	L	4-8	W	LW	++	235

<sup>1</sup> E = e. U.S. west to Great Plains, S = s. Ariz./s. Calif., T = Texas, T+ = e. N.M. to cen. Texas.

<sup>2</sup> S = under 1/4 in., M = 1/4-3/8 in., L = over 2 in.

<sup>3</sup> T = thin, 1/32 in., N = narrow, 1/16 in., M = medium, 1/8-1/4 in., W = wide, 3/16 in. or more.

<sup>4</sup> B = ball-shaped, L = loose, R = red, S = slim spikes, W = white, Y = yellow.

<sup>5</sup> - = 1-3 in., ± = 2-4 in., + = 3-6 in., ++ = 8-18 in.

<sup>6</sup> pay-low-VEHR-deh.

<sup>7</sup> wah-HEE-yo.

<sup>8</sup> poin-see-AHN-ah.







BLUE PALOVERDE



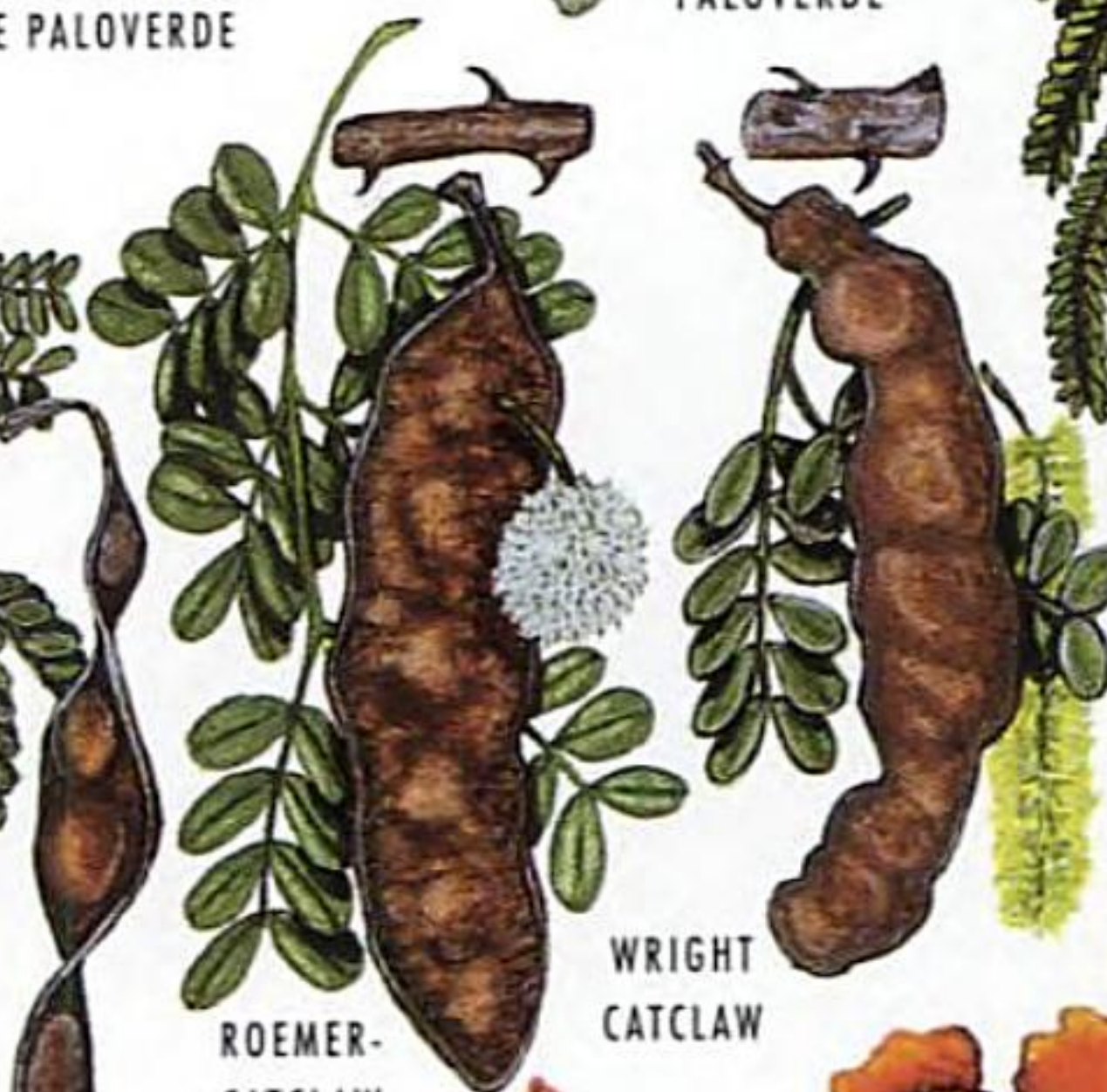
TEXAS PALOVERDE



GUAJILLO



GREGG CATCLAW



ROEMER-CATCLAW



WRIGHT CATCLAW



DWARF POINCIANA



HONEY LOCUST



THORNLESS TREES WITH ALTERNATE LEAVES  
ONCE-COMPOUND AND TOOTHED: I

Trees with feather-compound leaves and large shield-shaped leaf scars, buds hairy, spur branches absent. Walnuts:<sup>3</sup> branchlets with pith chambered, buds gray, bundle scars 3 or in 3 groups, nut husks do not split. Hickories: pith solid, buds yellow or rusty, bundle scars many, nut husks 4-parted. Tree-of-heaven: pith yellowish, large; buds brown-hairy; teeth only 2-4, glandular; fruits papery. See Silk-oak.<sup>4</sup>

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaflets per leaf	Fruit length (in.)	Nut (not husk) <sup>2</sup>	Text page
<b>HINDS WALNUT</b> <i>Juglans hindsii</i> Leaflets 2½-4 in.; native cen. Calif.	P	15-19	1½-2	NG	237
<b>CALIFORNIA WALNUT</b> <i>Juglans californica</i> Leaflets 1-2½ in. long; native coastal s. Calif.	P	7-17	½-1	SG	237
<b>ARIZONA WALNUT</b> <i>Juglans major</i> Leaflets long-pointed; n. Ariz. to cen. Texas.	S	9-15	1-1½	DG	237
<b>TEXAS WALNUT</b> <i>Juglans microcarpa</i> Leaflets slim, teeth few; N.M. and Kansas to Mexico.	T	15-25	¾-1	DG	238
<b>BLACK WALNUT</b> <i>Juglans nigra</i> Leaflets wide; west to Texas/w. Okla.	E	15-23	1¼-2½	DG	238
<b>BLACK HICKORY</b> <i>Carya texana</i> Buds/twigs rusty-hairy.	E	(5-)7	1¼-2	RA	239
<b>PECAN</b> <i>Carya illinoensis</i> Buds yellow-hairy, twigs hairless.	E	9-17	1½-3	LS	239
<b>TREE-OF-HEAVEN</b> <i>Ailanthus altissima</i> Basal leaf glands; invades cities.	w	11-41	1-2	WD	240

<sup>1</sup> E = e. U.S., west to cen. Texas; P = Pacific area (Calif.); S = Southwest; T = Texas and nearby; w = widespread.

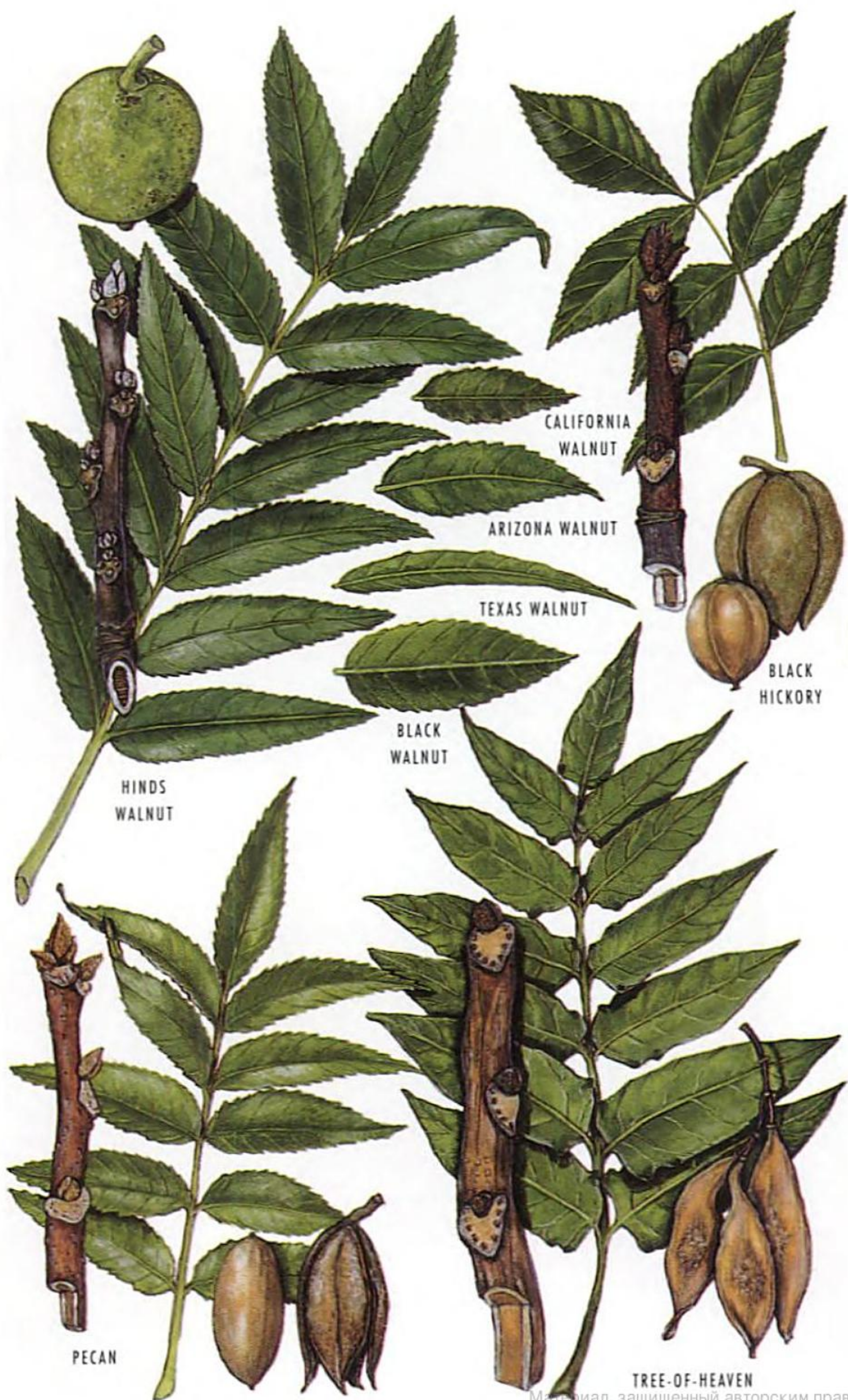
<sup>2</sup> DG = deep grooves; LS = longer than wide, smooth; NG = not grooved; RA = round, 4-angled; SG = shallow grooves; WD = fruits winged, dry, papery, in large clusters.

<sup>3</sup> For note on English Walnut, see pp. 236, 237.

<sup>4</sup> Lobed leaves of Silk-oak (Pl. 24) are sometimes described as toothed.









# THORNLESS TREES WITH ALTERNATE LEAVES ONCE-COMPOUND AND TOOTHED: II

Deciduous trees with leaf scars not shield-shaped. Pith continuous. Spur branches present in Mountain-ashes. See also Pl. 21. Some species of Pls. 23 and 24 occasionally with some toothed leaflets. Other sumacs are on Pls. 23, 24, 45, and 46.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length (in.)	Leaflets per leaf	Leaflet tips <sup>2</sup>	Bud type <sup>3</sup>	Leaf scars <sup>4</sup>	Bundle scars <sup>5</sup>	Fruit type <sup>6</sup>	Text page
<b>(CALIFORNIA HOPTREE</b> <i>Ptelea crenulata</i> ) Calif. only; see related species, Pl. 24.	P	4-6	3	BS	WW	U	3	DC	241
<b>SITKA MOUNTAIN-ASH</b> <i>Sorbus sitchensis</i> Basal 1/3 of leaflet without teeth; trunk smooth.	P	4-8	7-11	BS	RH	N	5	OA	242
<b>EUROPEAN MOUNTAIN-ASH</b> <i>Sorbus aucuparia</i> Leaflets white-hairy beneath; trunk with horizontal streaks.	C	4-8	9-15	S	WW	N	5	RA	242
<b>GREENE MOUNTAIN-ASH</b> <i>Sorbus scopulina</i> Leaflets toothed nearly to base, trunk smooth.	w	4-9	11-15	L	RN	N	5	RA	243
<b>SMOOTH SUMAC</b> <i>Rhus glabra</i> Twigs 3-sided; east from B.C./N.M.	w	12-24	11-31	L	WW	U	m	RH	243
<b>MEXICAN-BUCKEYE</b> <i>Ungnadia speciosa</i> Several stems normal; se. N.M./Texas.	T	5-12	5-7	L	DB	L	m	3C	244

<sup>1</sup> C = Canada and n. U.S., P = Pacific states and B.C., T = Texas/s. N.M., w = widespread.

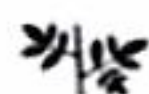
<sup>2</sup> B = blunt, L = long-pointed, S = short-pointed.

<sup>3</sup> DB = dark, blunt; RH = red-hairy; RN = red, not hairy; WW = white, woolly.

<sup>4</sup> N = narrow, L = lobed, U = U-shaped.

<sup>5</sup> m = many.

<sup>6</sup> DC = dry, circular; OA = orange, applelike, over 3/8 in.; RA = red, applelike, under 3/8 in.; RH = red-hairy; 3C = 3-lobed capsule.





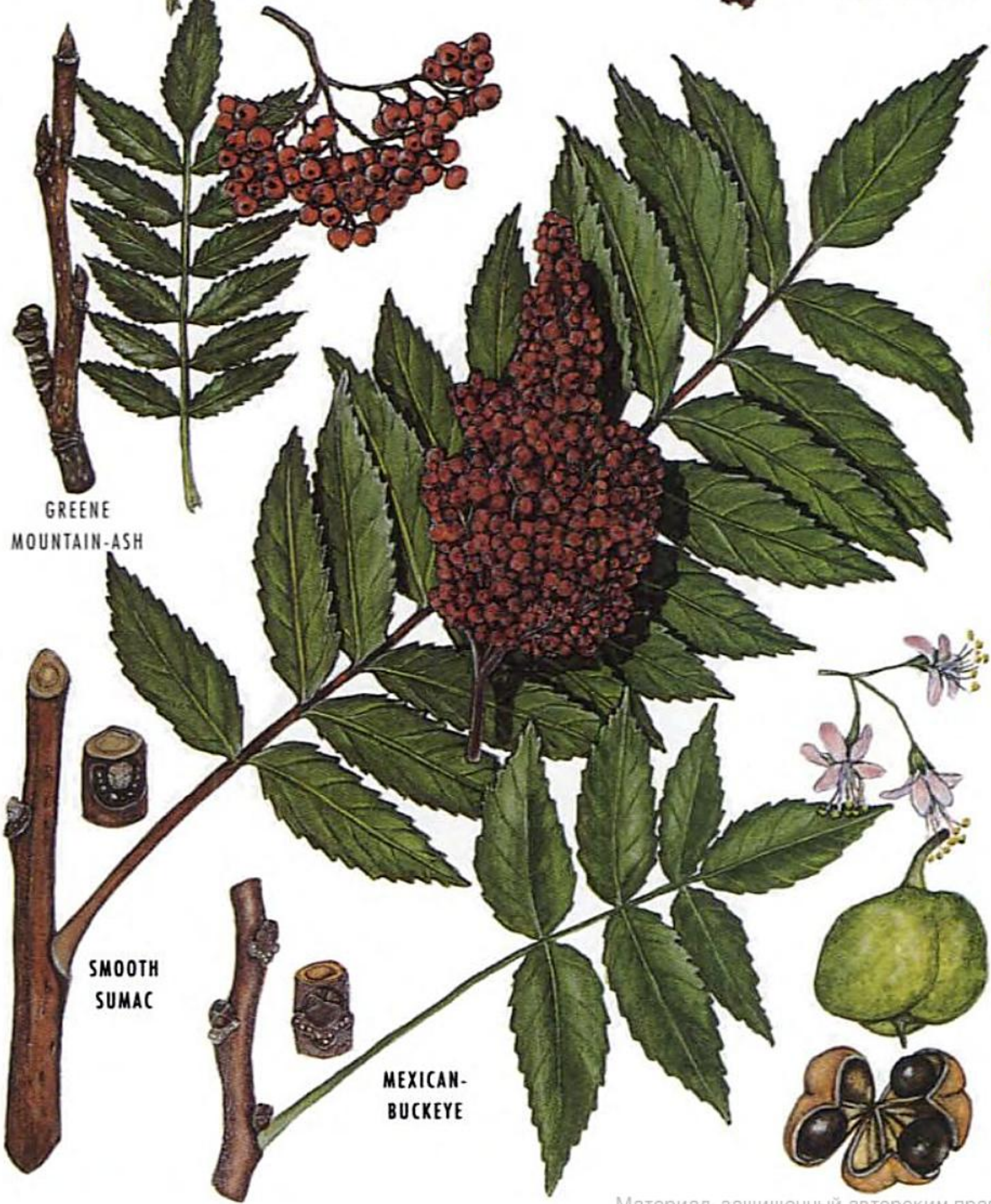
SITKA MOUNTAIN-ASH



EUROPEAN  
MOUNTAIN-ASH



GREENE  
MOUNTAIN-ASH



SMOOTH  
SUMAC

MEXICAN-  
BUCKEYE





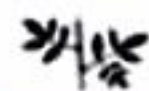
THORNLESS SOUTHWESTERN TREES  
WITH ALTERNATE ONCE-COMPOUND LEAVES  
MOSTLY NOT TOOTHED: I

Arid-zone trees with leaflets narrow (under 3/8 in. wide) and (except Peru Peppertree) under 3/4 in. long. The last 2 species are evergreen. See also Pl. 24. Other sumacs on Pls. 22, 24, 45, and 46.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaflets per leaf	Shape of leaflet tips <sup>2</sup>	Crushed leaves aromatic	Side twigs spiky <sup>3</sup>	Flower color <sup>4</sup>	Mature fruits <sup>5</sup>	Fruit size <sup>6</sup>	Text page
<b>ELEPHANT-TREE</b> <i>Bursera microphylla</i> Trunk short, massive, peeling.	S	20-40	R	+	+	W	DA	±	245
<b>FRAGRANT BURSER</b> <i>Bursera fagaroides</i> Mexico north to Pima Co., Ariz.	S	5-11	RL	+	+	W	DA	+	246
<b>WESTERN KIDNEYWOOD</b> <i>Eysenhardtia polystachya</i> Flower spikes 2-3 in. long.	S	20-56	RS	+	-	W	FP	+	246
<b>TEXAS KIDNEYWOOD</b> <i>Eysenhardtia texana</i> Flower spikes to 3 1/2 in. long.	T	15-30	R	+	-	W	FP	+	247
<b>LITTLELEAF SUMAC</b> <i>Rhus microphylla</i> Leafstalks winged, twigs stubby.	S	5-9	RS	-	+	G	RH	±	247
<b>TEXAS PISTACHIO</b> <i>Pistacia texana</i> Leaflet halves unequal.	T	9-21	T	-	-	-	RN	-	247
<b>PERU PEPPERTREE</b> <i>Schinus molle</i> Leaflets ± toothed; s. Calif. to s. Texas.	PT	17-41	LS	+	-	W	RF	-	248

<sup>1</sup> P = Pacific coast, S = Southwest, T = s. or w. Texas.  
<sup>2</sup> L = long-pointed, R = rounded, S = short-pointed, T = tiny sharp tips present.  
<sup>3</sup> Short, stiff, and somewhat pointed; spur branches also present.  
<sup>4</sup> G = greenish, W = white, - = no petals or sepals.  
<sup>5</sup> DA = dry, angled, 3-sided; FP = flat pod; RF = red, fleshy; RH = red-hairy; RN = red nut.  
<sup>6</sup> - = 1/8-1/4 in., ± = 1/8-3/16 in., + = 1/4-1/2 in. long.







ELEPHANT-TREE



FRAGRANT  
BURSERA



WESTERN  
KIDNEYWOOD



LITTLELEAF  
SUMAC



TEXAS  
PISTACHIO

TEXAS  
KIDNEYWOOD



PERU  
PEPPERTREE

IV



THORNLESS SOUTHWESTERN TREES  
WITH ALTERNATE ONCE-COMPOUND LEAVES  
MOSTLY NOT TOOTHED: II

Arid-zone trees with leaflets relatively wide and mostly over 1 in. long. Winged Sumac, Prairie Sumac, and Brazilian Peppertree have winged midribs. Several have evergreen foliage;\* others may have some leaves toothed. See also Pl. 23.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaflets per leaf	Leaflet tips <sup>2</sup>	Leaf scars U-shaped	Flower color <sup>3</sup>	Mature fruits <sup>4</sup>	Fruit size <sup>5</sup>	Text page
<b>TEXAS SOPHORA</b> <i>Sophora affinis</i> Leaves not leathery, buds hidden.	T	13-15	RS	±	W	BP	+	248
<b>*MESCALBEAN SOPHORA</b> <i>Sophora secundiflora</i> Leaves leathery, buds visible.	T	5-9	RN	±	P	bP	+	249
<b>*EVERGREEN SUMAC</b> <i>Rhus choriophylla</i> Mostly 3-5 leaflets.	S	3-7	SR	-	W	RH	o	250
<b>PRAIRIE SUMAC</b> <i>Rhus lanceolata</i> Leaflets 4x-8x width, much curved.	T	11-23	L	+	G	RH	o	250
<b>WINGED SUMAC</b> <i>Rhus copallina</i> Leaflets 2x-4x width; west to w./cen. Texas.	E	11-23	LS	+	G	RH	o	251
<b>COMMON HOPTREE</b> <i>Ptelea trifoliata</i> West to Utah/Ariz.; see Pl. 22.	ES	3	SL	+	G	bC	±	251
<b>WESTERN SOAPBERRY</b> <i>Sapindus drummondii</i> Leaflet halves unequal; east to sw. Mo.	ST	8-18	L	-	W	YB	-	252
<b>*BRAZILIAN PEPPERTREE</b> <i>Schinus terebinthefolia</i> Aromatic, leafstalks red.	PS	3-11	RS	-	W	RF	o	253
<b>*SILK-OAK</b> <i>Grevillea robusta</i> Leaflets lobed, ± hairy.	PS	3-16	D	-	RY	SP	±	253

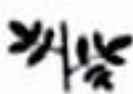
<sup>1</sup> E = e. U.S., P = Pacific coast, S = Southwest, T = Texas and (often) bordering states.

<sup>2</sup> D = leaf divided into lobes, L = long-pointed, N = notched, R = rounded, S = short-pointed.

<sup>3</sup> G = greenish, P = purple, R = red, W = white, Y = yellow.

<sup>4</sup> BP = black-beaded pod; bP = brown, somewhat beaded pod; bC = brownish, circular, dry, winged; RF = red, fleshy; RH = red-hairy heads; SP = stalked pods; YB = yellowish, berrylike.

<sup>5</sup> o = 1/8-3/16 in., - = 3/8-1/2 in., ± = 3/4-1 in., + = 1-5 in. long.





MESCALBEAN SOPHORA



TEXAS SOPHORA



WINGED SUMAC



PRAIRIE SUMAC



IV

EVERGREEN SUMAC



COMMON HOPTREE



WESTERN SOAPBERRY



BRAZILIAN PEPPERTREE



SILK-OAK





THORNLESS SOUTHWESTERN TREES  
WITH ALTERNATE LEAVES TWICE-COMPOUND

Leaves 2–12 in. long; leaflets ± blunt or appearing so, mostly not toothed, ever-green; flowers/fruits at twig ends; fruits flattened and mostly hairless pods. All members of the pea group. Chinaberry is an exception to many items above. Thorny species on Pls. 19–20. Brazilian Peppertree (Pl. 24) may be wavy-toothed.

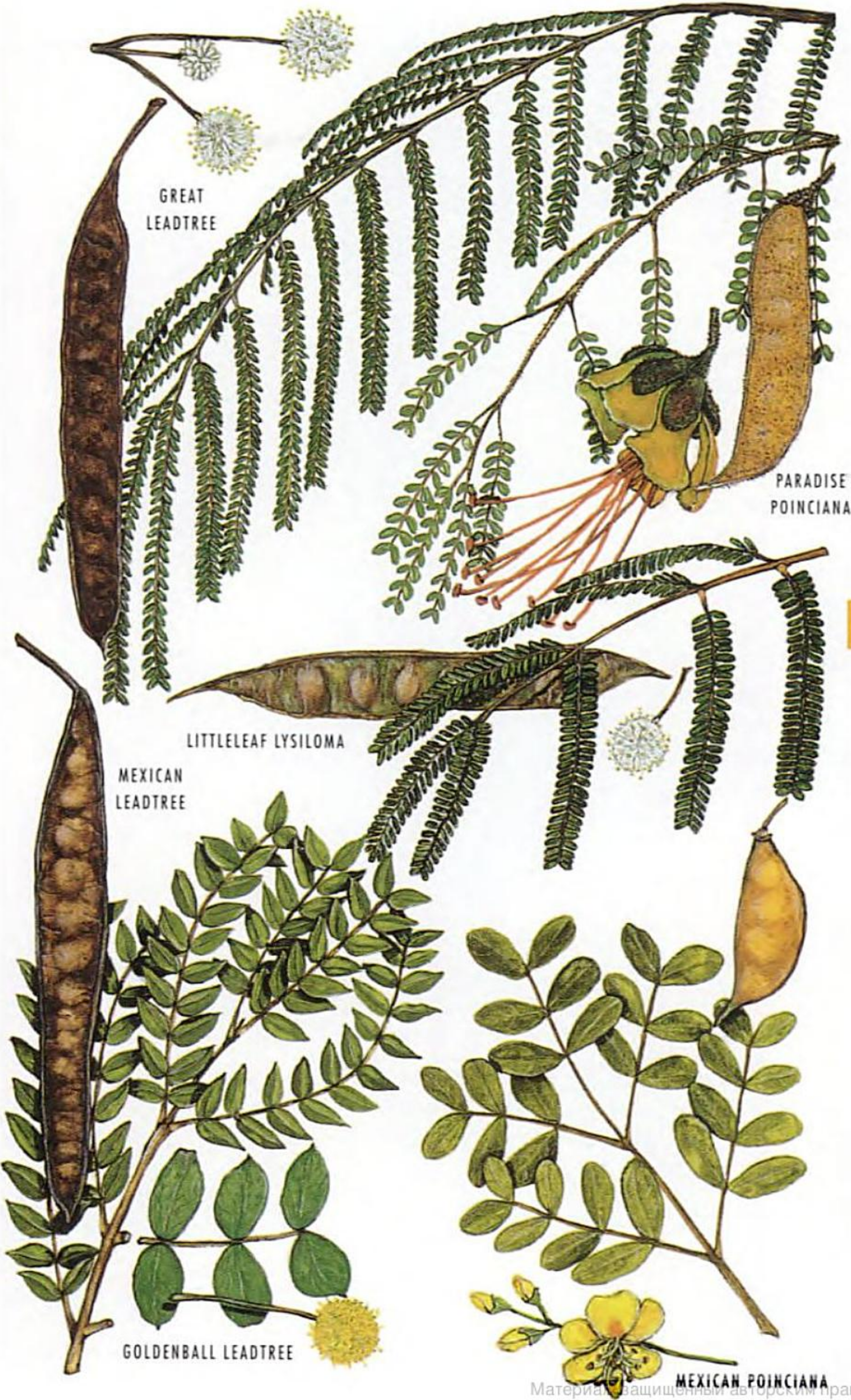
SPECIES AND REMARKS

	Distribution in Texas <sup>1</sup>	Pairs of major leaflets	Minor leaflet width (in.)	Flower clusters <sup>2</sup>	Fruit pod length (in.)	Text page
<b>GREAT LEADTREE</b> <i>Leucaena pulverulenta</i> Leaves large, fernlike.	s	14–20	1/32	BW	4–12	254
<b>PARADISE POINCIANA</b> <i>Caesalpinia gilliesii</i> Twigs hairy; to s. Calif.	s	6–12	1/16	LY	2–4	255
<b>LITTLELEAF LYSILOMA</b> <i>Lysiloma microphylla</i> Rincon Mts., se. Ariz.	S	4–9	1/16	BW	4–8	255
<b>MEXICAN LEADTREE</b> <i>Leucaena leucocephala</i> Leaflets only pointed.	s	4–8	3/16	BW	4–6	256
<b>GOLDENBALL LEADTREE</b> <i>Leucaena retusa</i> Tiny leaflet tips.	w	2–4	7/16	BY	3–10	256
<b>MEXICAN POINCIANA</b> <i>Caesalpinia mexicana</i> Leaflet tips rounded.	s	2–5	5/16	LY	1–3	257
<b>(DWARF POINCIANA</b> <i>Caesalpinia pulcherrima</i> ) S. Calif. to Texas; rarely tree size; Pl. 20.	s	5–10	5/16	LR	3–5	234
<b>(CHINABERRY</b> <i>Melia azedarach</i> ) <sup>3</sup> Leaflets 1–3 in. long, long-pointed, coarse-toothed.	E	5–9	H	LP	1/2	257

<sup>1</sup> E = e. U.S. west to s. and cen. Texas, s = s. Texas, w = w. Texas, S = se. Ariz.  
<sup>2</sup> B = ball-like; L = longer, loose; P = purple; R = red; W = white; Y = yellow.  
<sup>3</sup> Fruits not pods but clustered, yellow, poisonous balls 1/2 in. in diameter.







GREAT  
LEADTREE

PARADISE  
POINCIANA

LITTLELEAF  
LYSIOMA

MEXICAN  
LEADTREE

GOLDENBALL  
LEADTREE

MEXICAN  
POINCIANA

IV



LEAFLESS DESERT TREES WITH TWIGS SPINE-TIPPED BUT OTHERWISE THORNLESS

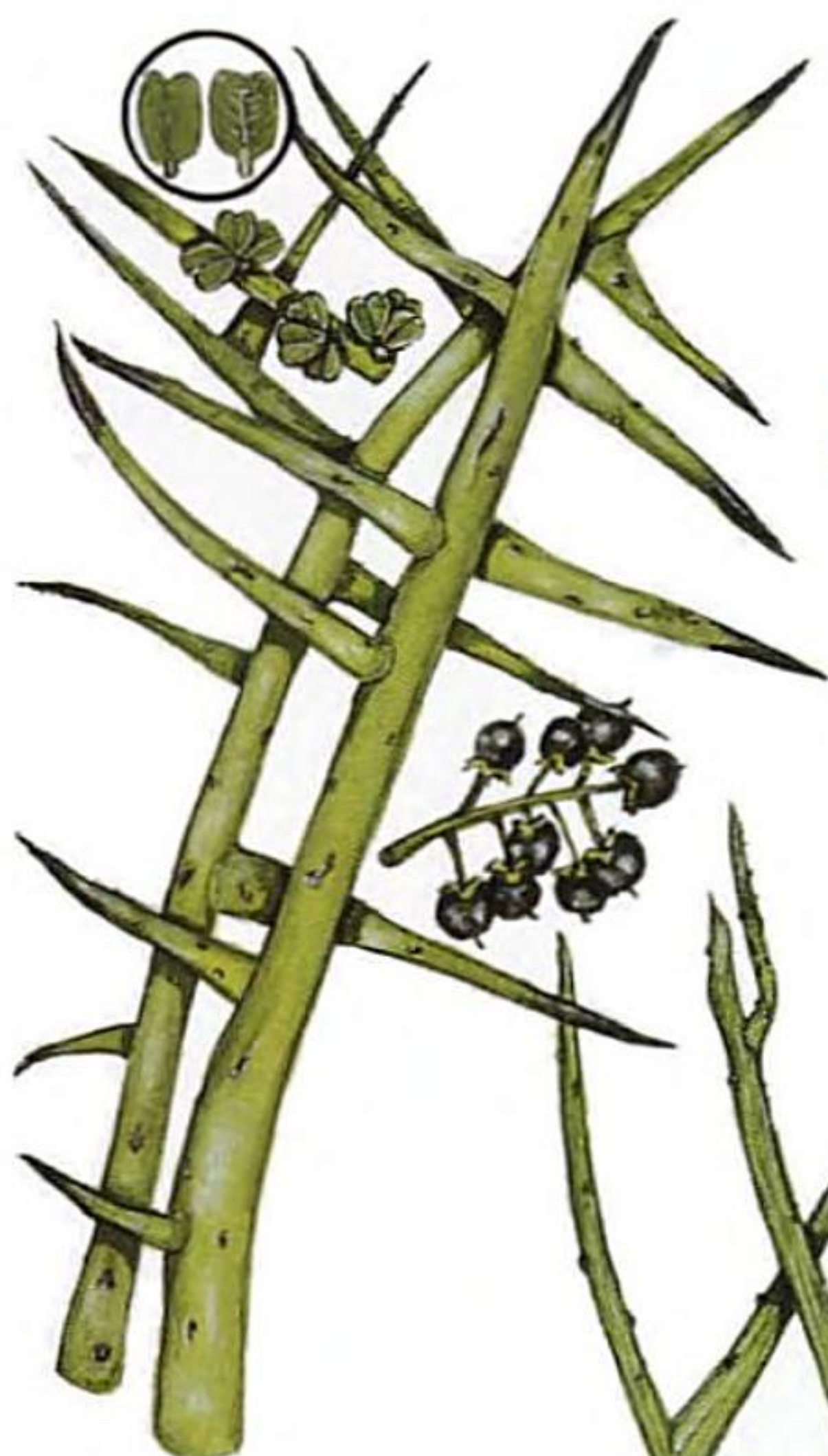
Trees of the southwestern deserts. Leaves tiny but usually absent except briefly in spring, mostly simple.<sup>1</sup> Twigs greenish and function as foliage. Twig ends sharp; small side thorns absent. Flowers clustered. Top 3 species all sometimes called Crucifixion-thorn. See also Jerusalem-thorn (Pl. 19), other paloverdes (Pl. 20), and leafy spine-tipped trees (Pl. 28). Leaves are alternate.

SPECIES AND REMARKS

	Twigs mostly at right angles	Twigs stout, stiff	Twigs fine-hairy	Trunk bark <sup>2</sup>	Flower color <sup>3</sup>	Fruit type <sup>4</sup>	Text page
<b>ALLTHORN</b> <i>Koeberlinia spinosa</i> Twigs 1–2 in., green; se. Calif. to s. Texas.	+	+	–	G	G	B	259
<b>CRUCIFIXION-THORN</b> <i>Holacantha emoryi</i> Fruits dry, starlike; se. Calif./s. Ariz.	–	+	±	G	R	D	260
<b>CANOTIA</b> <i>Canotia holacantha</i> Twigs yellow, fine grooves, <sup>5</sup> tiny leaf scars black; Ariz./s. Utah.	–	–	–	G	G	D	260
<b>SMOKETHORN</b> <i>Psoralea spinosa</i> Twigs gray, “smoky,” tiny leaf scars brown; se. Calif./w. Ariz./s. Nev.	–	–	+	Gr	P	O	261
<b>YELLOW PALOVERDE</b> <i>Cercidium microphyllum</i> <sup>1</sup> Twigs yellow, leaflets 8–16; se. Calif./Ariz.	–	±	–	Y	Y	P	262

<sup>1</sup> Yellow Paloverde has small feather-compound leaves in season (see also Pl. 20).  
<sup>2</sup> G = greenish, Gr = gray, Y = yellow-green.  
<sup>3</sup> G = greenish, P = purple, R = reddish purple, Y = yellow.  
<sup>4</sup> B = blackish berry; D = dry brownish capsule; O = one-seeded, tiny pea-pod; P = pea-pod, beaded.  
<sup>5</sup> Use lens.





ALLTHORN



CRUCIFIXION-THORN

CANOTIA



SMOKETHORN



leaf



fruit



YELLOW PALOVERDE



# THORNY TREES WITH ALTERNATE SIMPLE LEAVES TOOTHED

Long bare spines in hawthorns; paired thorns in Jujube; sharp short branches in others. Leaves mostly over 1 in. long with sharp teeth; mostly deciduous.

No twigs alternate at right angles and no species with milky sap (see Pl. 28).

Spur branches present. Bundle scars 3 (1 in *Ziziphus* and this *Rhamnus*).

Species sometimes thorny on Pls. 39, 42, 43, and 44.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf characteristics <sup>2</sup>	Leaf bases with glands <sup>3</sup>	Twigs hairy	Trunk w/ horizontal lines	Flower color/location <sup>4</sup>	Fruit color/type <sup>5</sup>	Text page
<b>BLACK HAWTHORN</b> <i>Crataegus douglasii</i> Trees variable, fruits red to dark.	w	L	-	-	-	WE	VA	264
<b>OREGON CRABAPPLE</b> <i>Malus fusca</i> Leaves ± hairy; Pacific Northwest.	P	L	-	+	-	WS	RA	264
<b>(PRAIRIE CRABAPPLE</b> <i>Malus ioensis</i> ) Leaves/twigs woolly; to cen. Texas.	E	L	-	+	-	WS	GA	265
<b>KLAMATH PLUM</b> <i>Prunus subcordata</i> Leaves ± round; Calif./Ore. mts.	P	W	±	±	±	WS	DP	266
<b>DESERT APRICOT</b> <i>Prunus fremontii</i> Leaves to 1 in.; s. Calif. area.	P	W	±	-	-	WS	YP	266
<b>AMERICAN PLUM</b> <i>Prunus americana</i> Leaves wide; west to Sask./N.M.	E	D	-	±	+	WS	RP	266
<b>CHICKASAW PLUM</b> <i>Prunus angustifolia</i> Leaves narrow; west to Colo./N.M.	E	S	+	-	+	WS	RP	267
<b>HOLLYLEAF BUCKTHORN</b> <i>Rhamnus crocea</i> Leaves to 1½ in., spiny, evergreen.	PS	E	-	±	-	YS	RB	267
<b>JUJUBE</b> <i>Ziziphus jujuba</i> Leaves fan-veined, one thorn larger.	T	V	-	+	-	GS	DF	268

<sup>1</sup> E = e. U.S. to plains, P = Pacific states, S = Southwest, T = Texas, w = widespread.

<sup>2</sup> D = double-toothed, E = evergreen, L = ± lobed, S = single-toothed, V = 3-veined, W = wide, blunt.

<sup>3</sup> Raised dots on lower leaf edge or leafstalk.

<sup>4</sup> E = at twig ends, G = greenish, S = at side buds/spurs, W = white, Y = yellow.

<sup>5</sup> A = applelike, B = berrylike, D = dark, F = fleshy, G = green, H = hairy, P = plum, R = red, V = variable, Y = yellow.



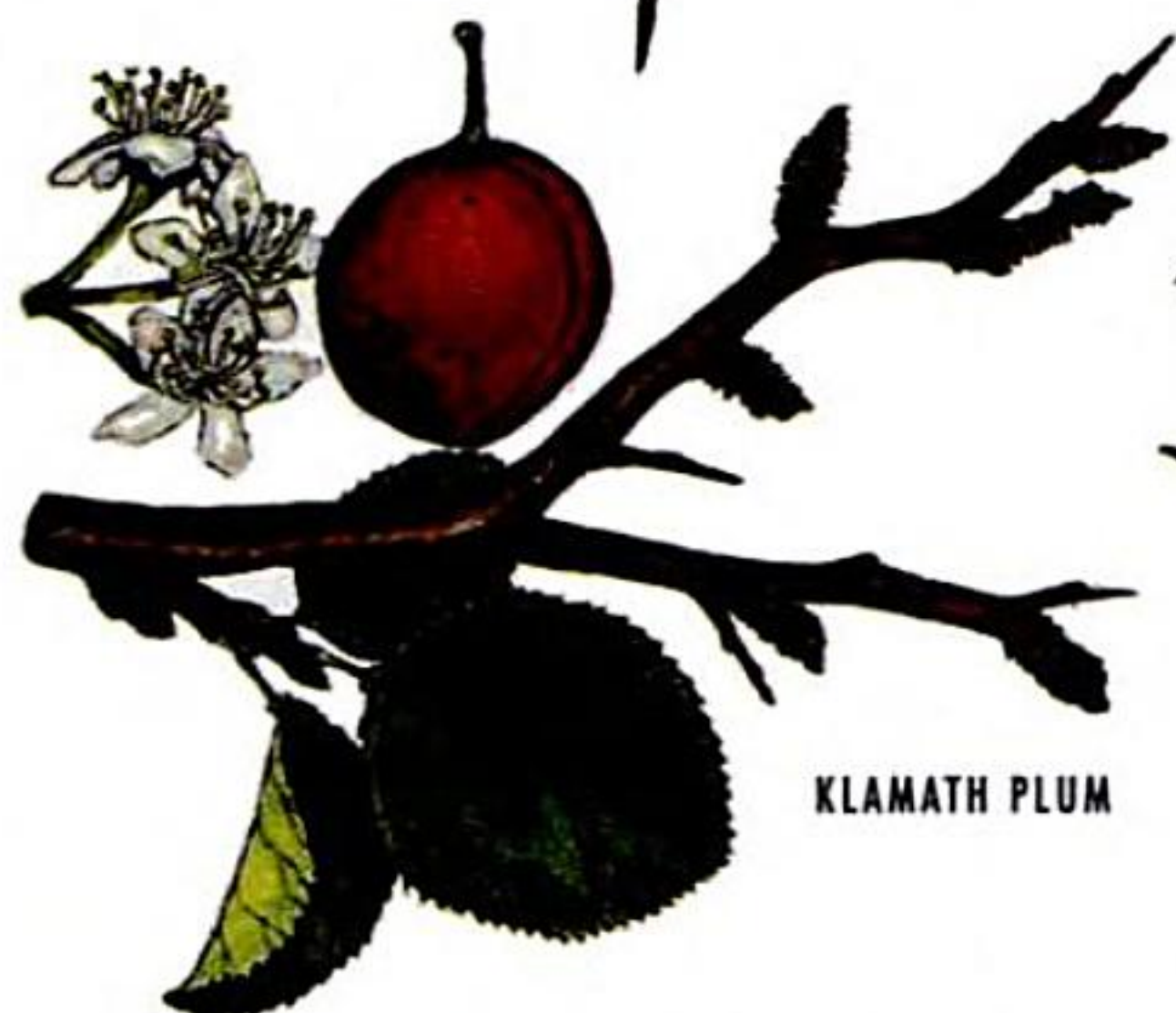




BLACK HAWTHORN



OREGON  
CRABAPPLE



KLAMATH PLUM



DESERT  
APRICOT



AMERICAN PLUM



CHICKASAW PLUM



HOLLYLEAF BUCKTHORN



JUJUBE



# THORNY TREES WITH ALTERNATE SIMPLE LEAVES NOT TOOTHED<sup>1</sup>

Except for Osage-orange, all occur wild only in the Southwest. Thorns single, mostly leafy; leaves mostly rounded at tips. Spur branches with clustered leaves often present. All but Osage-orange have spine-tipped twigs, often stiff and alternating.<sup>2</sup> *Bumelia* and *Maclura* have milky sap. See also Russian-olive (Pl. 39), sometimes thorny.

## SPECIES AND REMARKS

	Major distribution <sup>3</sup>	Leaf length (in.)	Leaf base shape	Flower clusters <sup>4</sup>	Fruit type/color <sup>5</sup>	Text page
<b>GREENBARK CEANOTHUS</b> <i>Ceanothus spinosus</i> <sup>2</sup> Evergreen, tiny leaf tips; <sup>6</sup> sw. Calif.	P	$\frac{3}{8}$ –1 $\frac{1}{4}$	U	BE	BC	269
<b>BITTER CONDALIA</b> <i>Condalia globosa</i> <sup>2</sup> Very spiny; sw. Ariz./se. Calif.	S	$\frac{1}{4}$ – $\frac{1}{2}$	V	WA	BB	270
<b>BLUEWOOD CONDALIA</b> <i>Condalia hookeri</i> <sup>2</sup> Tiny leaf tips; <sup>6</sup> cen. and s. Texas.	T	$\frac{1}{2}$ –1 $\frac{1}{2}$	V	GA	BB	270
<b>GUM BUMELIA</b> <i>Bumelia lanuginosa</i> Leaves/twigs $\pm$ hairy; Texas/se. Ariz.	ES	1–4	V	WA	BB	271
<b>SAFFRON-PLUM BUMELIA</b> <i>Bumelia celastrina</i> Twigs hairless; s. Texas and s. Fla.	T	$\frac{1}{2}$ –2	V	WA	BB	272
<b>(LONGLAF PEPPERTREE</b> <i>Schinus longifolius</i> <sup>2</sup> ) Spiny twigs to 5 in. long, leaves slim, s. Texas.	T	1–2	V	WA	LB	272
<b>OSAGE-ORANGE</b> <i>Maclura pomifera</i> Thorns bare, leaves long-pointed.	ET	1–8	U	GA	GW	272

<sup>1</sup> Seldom with a few teeth.

<sup>2</sup> Twigs in two planes, alternating at right angles; rows of twigs forming a + when the branch is viewed from its end.

<sup>3</sup> E = e. U.S., P = Pacific Slope, S = Southwest, T = Texas.

<sup>4</sup> A = at leaf angles, B = pale blue to white, E = at twig ends, G = greenish, W = white.

<sup>5</sup> BB = black, berrylike; BC = black, dry capsules; GW = green, grapefruit-size, much wrinkled; LB = lavender, berrylike.

<sup>6</sup> Use lens.





GREENBARK CEANOTHUS

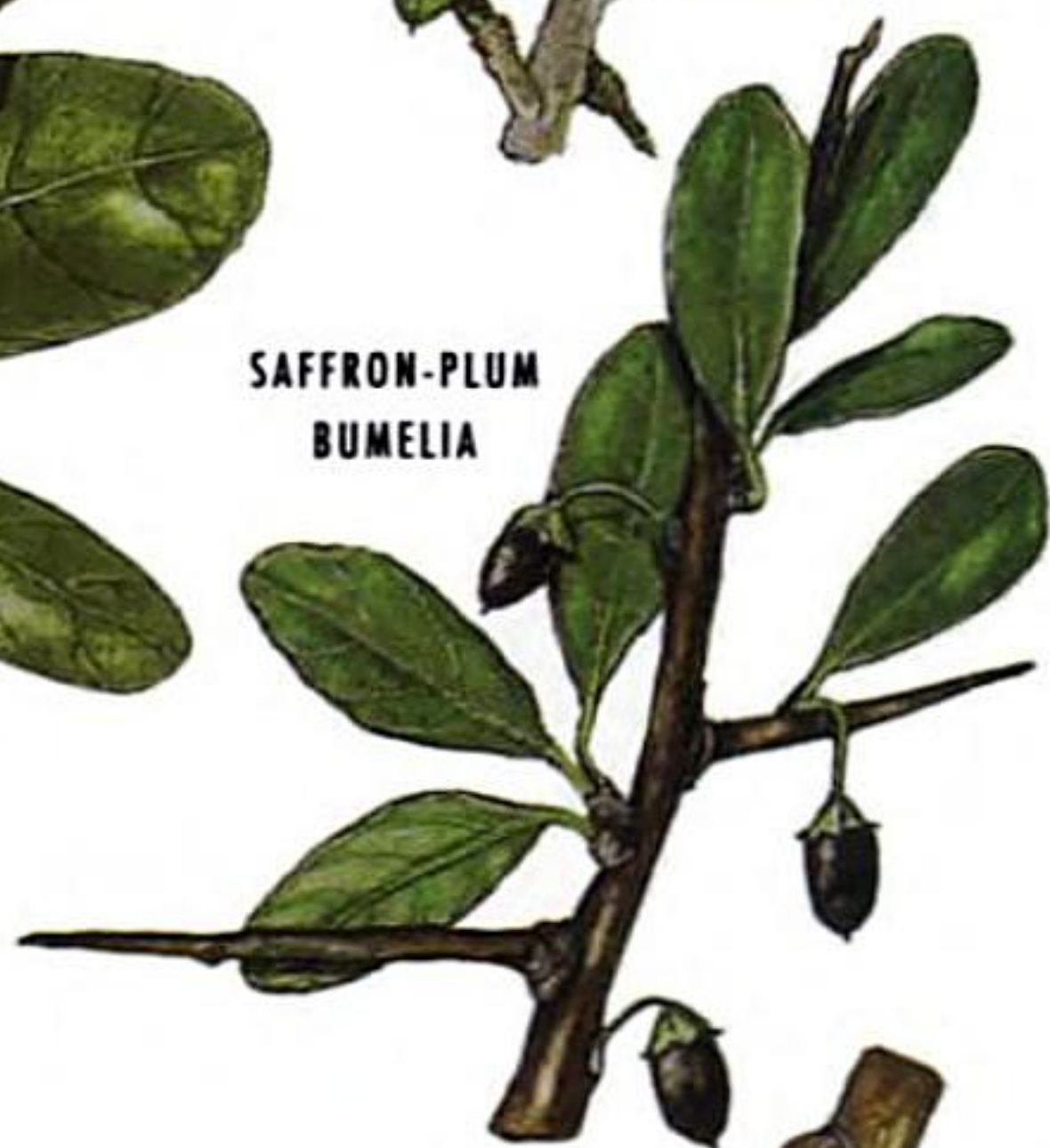
BITTER CONDALIA

BLUEWOOD CONDALIA



GUM BUMELIA

SAFFRON-PLUM  
BUMELIA



OSAGE-ORANGE



V



# THORNLESS TREES WITH ALTERNATE FAN-LOBED LEAVES

Some or all leaves lobed; 3–5 veins meet near leaf bases. Fremontia evergreen with showy yellow flowers. Mulberries with fibrous inner bark and milky sap. Sycamores with jigsawlike bark and buds covered by leafstalk bases. See also White Poplar (Pl. 31) and Cliffrose (Pl. 44). Fruits.<sup>6</sup>

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Lobes toothed	Lobes per leaf	Leaves sandpapery above	Leaves hairy beneath	Bud scales per bud	Bundle scars <sup>2</sup>	Text page
<b>CALIFORNIA FREMONTIA</b> <i>Fremontodendron californicum</i> <sup>3</sup> Leaves 1–2 in., main veins 1–3; spur branches present.	PS	±	3–5	±	+	0	1	273
<b>TEXAS MULBERRY</b> <i>Morus microphylla</i> Leaves 1–3 in. long, rough both sides, scales not dark-edged.	S	+	1–5	+	+	3–5	4+	274
<b>WHITE MULBERRY</b> <i>Morus alba</i> <sup>4</sup> Buds reddish, scales not dark-edged.	E	+	1–5	–	–	5–6	4+	274
<b>RED MULBERRY</b> <i>Morus rubra</i> Buds green, scales dark-edged.	E	+	1–3	+	+	5–6	4+	275
<b>PAPER-MULBERRY</b> <i>Broussonetia papyrifera</i> Twigs hairy, pith partitioned.	E	+	1–5	+	+	2–3	4+	275
<b>CALIFORNIA SYCAMORE</b> <i>Platanus racemosa</i> <sup>5</sup> Leaf lobes halfway, fruit balls 3–7.	P	±	3–5	–	+	1	m	277
<b>ARIZONA SYCAMORE</b> <i>Platanus wrightii</i> <sup>5</sup> Leaf lobes over half, fruit balls 3–5.	S	–	5–7	–	±	1	m	277
<b>CHINESE PARASOLTREE</b> <i>Firmiana simplex</i> Twigs green, buds hairy.	L	–	3–5	–	±	2–3	1+	277
<b>SWEETGUM</b> <i>Liquidambar styraciflua</i> Crushed leaves spicy; parks.	E	+	5–7	–	–	5–6	3	278
<b>TULIPTREE</b> <i>Liriodendron tulipifera</i> <sup>5</sup> Buds spicy, pith chambered; parks.	E	–	4	–	–	2	4+	278

<sup>1</sup> E = e. U.S. west to cen. Texas, planted West; L = local escape from cultivation; P = Pacific region, Calif.; PS = Calif./cen. Ariz./n. Mexico; S = Southwest.

<sup>2</sup> m = many.

<sup>3</sup> See also Mexican Fremontia, p. 274.

<sup>4</sup> Escaped in Calif. and Wash.

<sup>5</sup> Twigs ringed; see also Eastern Sycamore, p. 277.

<sup>6</sup> Fruits — fremontia: dry 1-in. capsule; sycamores: dry 1-in.-wide brown balls; mulberries/Paper-mulberry: blackberrylike, multiple, fleshy; Sweetgum: prickly brown balls; Tuliptree: winged, dry, 1–2-in. whitish clustered keys.



CALIFORNIA FREMONTIA



TEXAS  
MULBERRY



WHITE  
MULBERRY



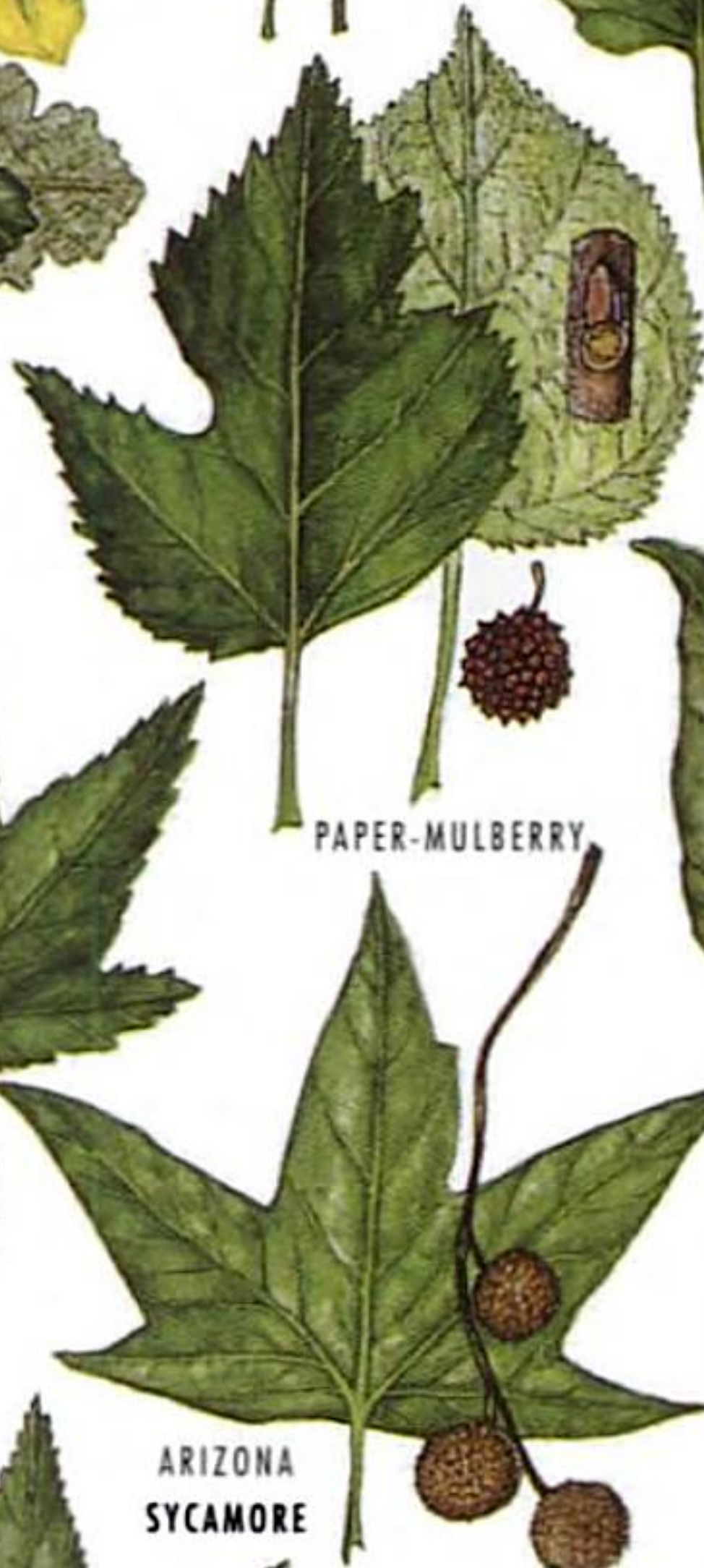
RED  
MULBERRY



CHINESE  
PARASOLTREE



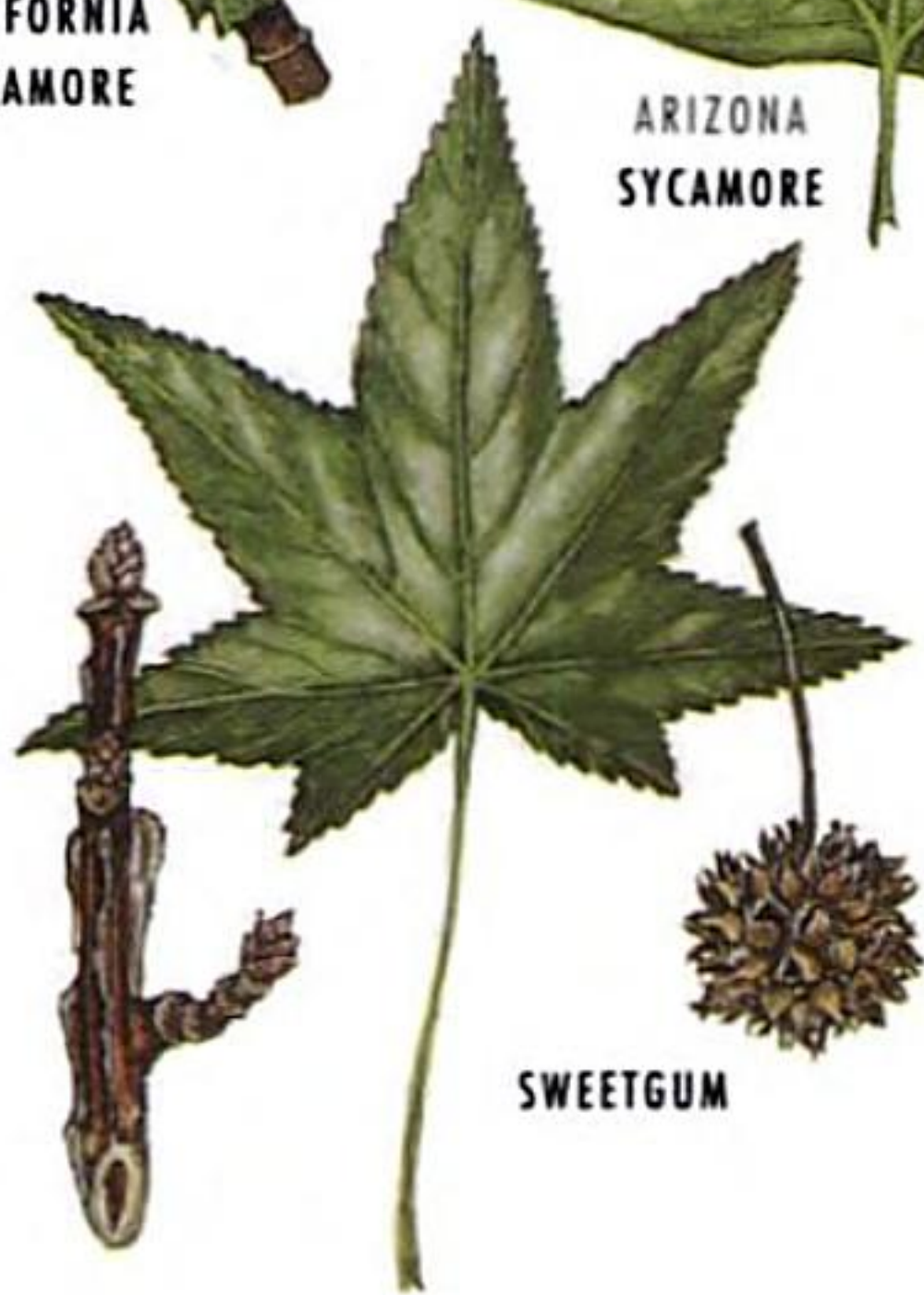
PAPER-MULBERRY



CALIFORNIA  
SYCAMORE



ARIZONA  
SYCAMORE



SWEETGUM



TULIPTREE

V



# THORNLESS TREES WITH ALTERNATE SIMPLE LEAVES FAN-VEINED

Three or more main veins meet at the leaf base. Hackberries have trunks warty, twigs hairy, pith chambered, leaves rough-hairy, mostly leathery with bases uneven. Fruits mostly wrinkled when dry; fruitstalks mostly longer than leafstalks. Ceanothuses and Camphor-tree evergreen. See also Jujube (Pl. 27), Greenbark Ceanothus (Pl. 28), fremontias and mulberries (Pl. 29), and poplars (Pl. 31), also fan-veined.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaves toothed	Leaf shape <sup>2</sup>	Bundle scars	Flowers <sup>3</sup>	Fruits <sup>4</sup>	Text page
<b>CALIFORNIA REDBUD</b> <i>Cercis occidentalis</i> Fruit pods more than ½ in. wide.	PS	—	H	3	P	P	279
<b>(EASTERN REDBUD</b> <i>Cercis canadensis</i> ) Fruit pods less than ¼ in. wide.	E	—	H	3	P	P	280
<b>CAROLINA BASSWOOD</b> <i>Tilia caroliniana</i> Buds 2–3 scales, inner bark tough.	E	+	H	4+	Y	S	280
<b>NETLEAF HACKBERRY</b> <i>Celtis reticulata</i> Fruits smooth when dry.	w	±	L	3	G	R	282
<b>SOUTHERN HACKBERRY</b> <i>Celtis laevigata</i> Fruits dry ± smooth, stalks short.	E	±	L	3	G	R	282
<b>LINDHEIMER HACKBERRY</b> <i>Celtis lindheimeri</i> Leaves narrow, pale-hairy beneath; s. Texas.	T	±	L	3	G	R	282
<b>NORTHERN HACKBERRY</b> <i>Celtis occidentalis</i> Leaves not leathery, teeth numerous.	E	+	L	3	G	R	283
<b>BLUEBLOSSOM CEANOTHUS</b> <i>Ceanothus thyrsiflorus</i> Twigs angled, leaves hairless.	P	+	BE	1	B	B	283
<b>(SNOWBRUSH CEANOTHUS</b> <i>Ceanothus velutinus</i> ) Twigs smooth, leaves hairless (at least on veins).	P	+	W	1	W	B	284
<b>(FELTLEAF CEANOTHUS</b> <i>Ceanothus arboreus</i> ) Twigs smooth, leaves white-hairy; islands.	P	+	W	1	B	B	284
<b>CAMPHORTREE</b> <i>Cinnamomum camphora</i> Spicy, glands on veins beneath.	I	—	LE	1	Y	B	284

<sup>1</sup> B = Great Basin, E = e. U.S. to cen. Texas, I = foreign introduction, P = Pacific Slope, S = Southwest, T = Texas, w = widespread.

<sup>2</sup> B = blunt, E = elliptic, H = heart-shaped, L = long-pointed, W = wide.

<sup>3</sup> B = blue, G = greenish, P = pink, Y = yellow.

<sup>4</sup> B = black, 2–3 seeds; P = pea-pods; R = round, small, brownish; S = small spheres with leaflike parachute wing.



CALIFORNIA  
REDBUD



CAROLINA  
BASSWOOD



NETLEAF  
HACKBERRY



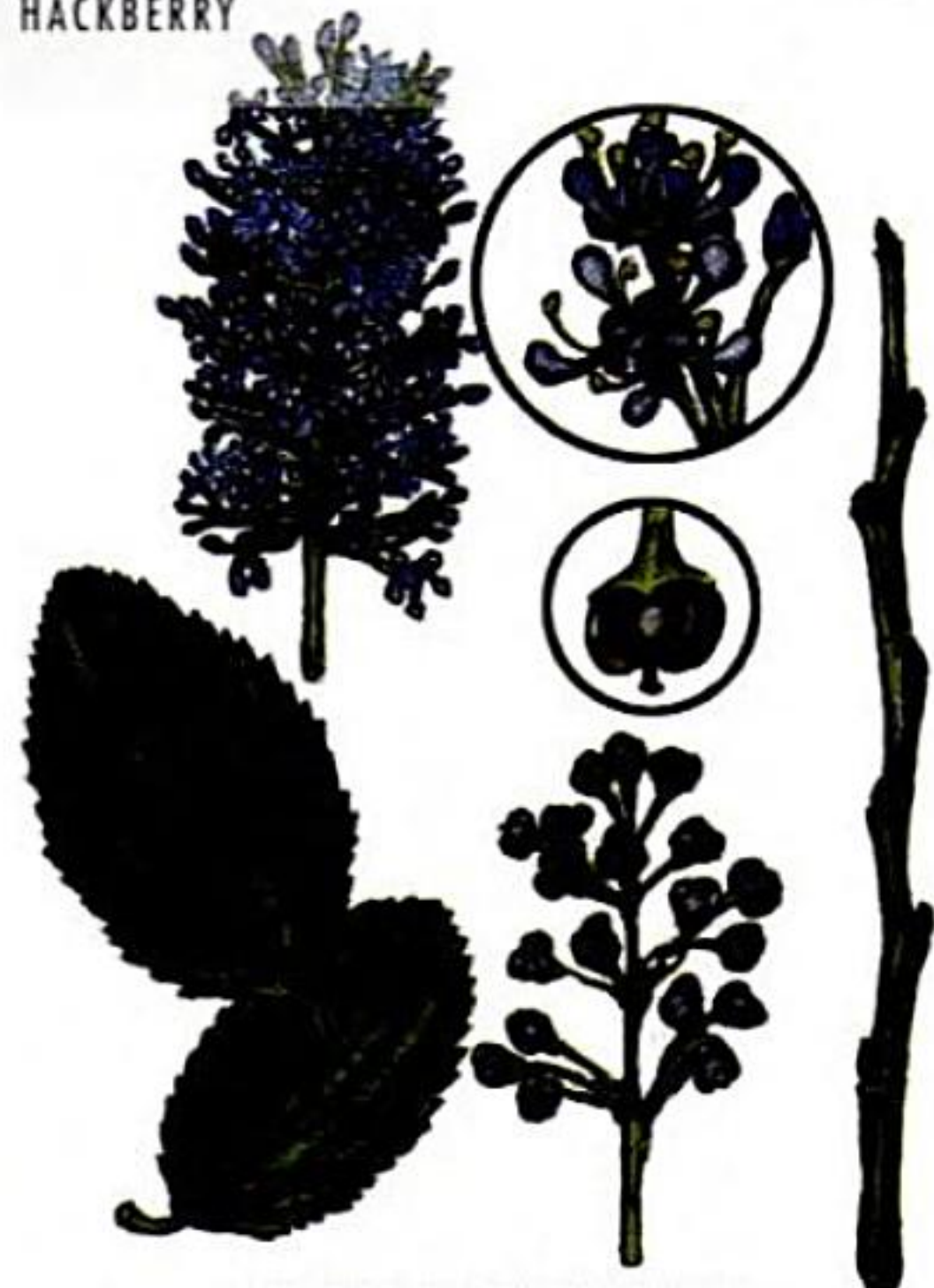
SOUTHERN  
HACKBERRY



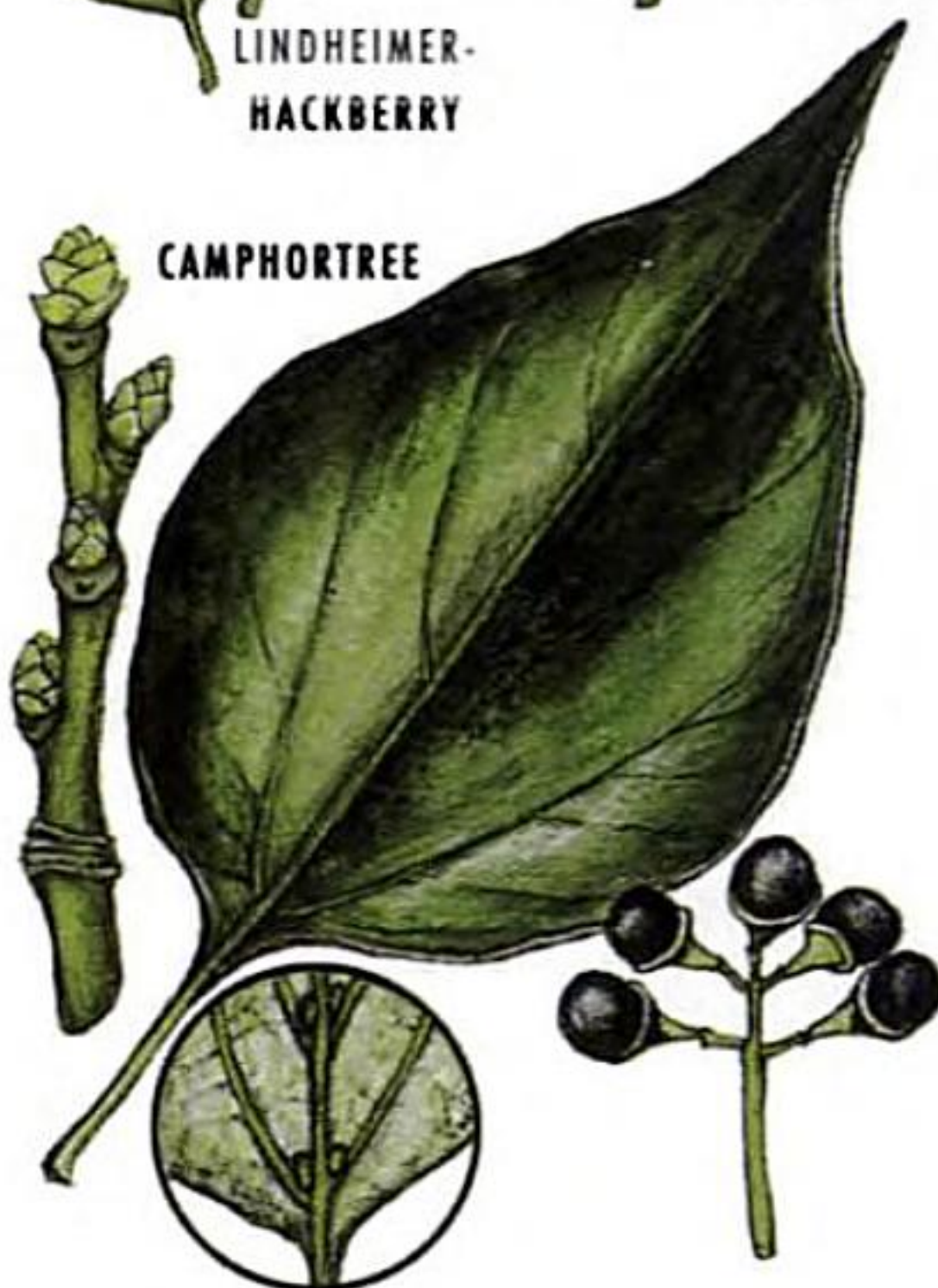
LINDHEIMER-  
HACKBERRY



NORTHERN  
HACKBERRY



BLUEBLOSSOM CEANOOTHUS



CAMPHORTREE

V



# POPLARS, INCLUDING ASPENS AND COTTONWOODS

Leaves toothed, with 3–5 main veins meeting near the leaf base; mostly triangular. Leafstalks mostly long. Lowermost bud scale exactly above the leaf scar. Bundle scars 3. Young bark smooth and yellow-green to chalky white. Fruits dry capsules, seeds hairy or fluffy. See also Tallowtree, p. 286.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leafstalks flattened	Leaf length (in.)	Twig color <sup>2</sup>	Bud scales <sup>3</sup>	Mature end bud length (in.)	Text page
<b>QUAKING ASPEN</b> <i>Populus tremuloides</i> Leaves round, teeth small.	w	+	2–6	B	N	1/4–3/8	286
<b>FREMONT COTTONWOOD</b> <i>P. fremontii</i> Leaves wide, teeth large.	PR	+	2–5	Y	N	3/8–1/2	287
<b>NARROWLEAF COTTONWOOD</b> <i>P. angustifolia</i> Leaves narrow, stalks short, to 1 in.	R	±	3–5	Y	G	1/4–1/2	288
<b>LOMBARDY POPLAR</b> <i>P. nigra</i> var. <i>italica</i> Tree narrow, columnar, planted.	Iw	+	2–8	Y	N	1/4–3/8	289
<b>BLACK COTTONWOOD</b> <i>P. trichocarpa</i> <sup>4</sup> Leaves whitish beneath, buds spicy. <sup>7</sup>	PR	–	4–8	B	G	3/4–7/8	289
<b>WHITE POPLAR</b> <i>P. alba</i> <sup>5</sup> Leaves, twigs white-hairy.	Iw	±	2–6	W	H	1/4–1/2	290
<b>EASTERN COTTONWOOD</b> <i>P. deltoides</i> <sup>7</sup> Leaf teeth coarse; buds not spicy.	E	+	2–8	Y	G	5/8–1	290
<b>BALSAM POPLAR</b> <i>P. balsamifera</i> <sup>6, 7</sup> Leaf teeth fine; buds spicy.	C	–	6–10	B	G	5/8–1	291

<sup>1</sup> C = Canada/Alaska, E = e. U.S. to Great Plains, I = foreign introduction, P = Pacific states and B.C., R = Rocky Mt. region, w = widespread.

<sup>2</sup> B = brown, W = white-hairy, Y = yellowish.

<sup>3</sup> G = gummy, H = hairy, N = neither of these.

<sup>4</sup> Fruits 3-parted.

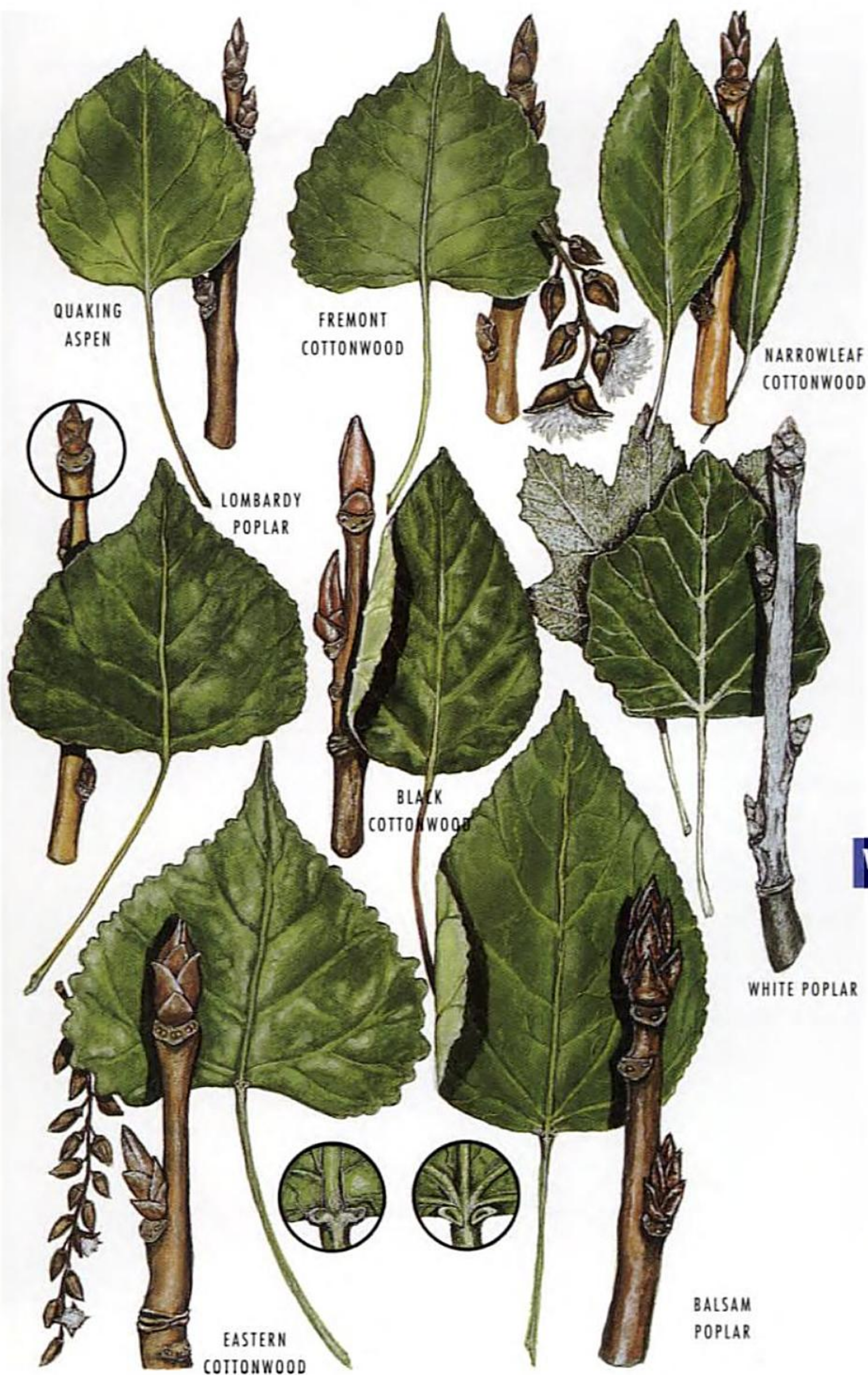
<sup>5</sup> Leaves often shallowly to deeply lobed.

<sup>6</sup> Fruits 2-parted.

<sup>7</sup> Leaf base glands present: Black Cottonwood ±, Eastern Cottonwood +, Balsam Poplar ±.









OAKS I: WESTERN OAKS WITH DECIDUOUS  
AND MOSTLY LOBED LEAVES

Buds clustered at twig tips, flowers in catkins, fruits acorns. These oaks with leaves 2–7 in. long. Acorn cups mostly bowl-shaped. Range overlap minimal. California Scrub Oak (Pl. 33) may have some lobed leaves. Except California Black and Graves oaks, all are members of the white oak group.<sup>1</sup> In w. Texas, see also Lateleaf Oak (Pl. 34). In the plains states, see also Pl. 35.

## SPECIES AND REMARKS

	Major distribution <sup>2</sup>	Leaf lobe depth <sup>3</sup>	Leaves hairy beneath	Twigs hairy	Buds over ¼ in. long	Buds sharp	Buds hairy	Text page
<b>CALIFORNIA BLACK OAK</b> <i>Quercus kelloggii</i> <sup>5</sup> Dry slopes, Calif./Ore.	P	D	±	±	±	+	—	293
<b>OREGON OAK</b> <i>Q. garryana</i> <sup>4</sup> Leaves leathery; B.C. to cen. Calif.	P	D	+	±	+	+	+	294
<b>VALLEY OAK</b> <i>Q. lobata</i> Leaves thin, stalks under ½ in.; Calif.	P	D	—	—	±	+	±	295
<b>BLUE OAK</b> <i>Q. douglasii</i> Leaves 1–3 in., wavy/toothed; foothills.	P	S	±	+	±	—	—	296
<b>GAMBEL OAK</b> <i>Q. gambelii</i> Dry slopes, Utah/s. Wyo. south.	R	D	±	—	—	+	—	296
<b>(WAVYLEAF OAK</b> <i>Q. undulata</i> ) Hybrid; see p. 296.	R	M	±	±	—	+	—	297
<b>HAVARD (SHIN) OAK</b> <i>Q. havardii</i> Shrubby ±; w. Okla/w. Texas/e. N.M.	T	S	±	±	—	—	—	298
<b>LACEY OAK</b> <i>Q. laceyi</i> <sup>4</sup> Shrubby ±; Edwards Plateau.	T	S	—	—	—	+	+	298
<b>GRAVES OAK</b> <i>Q. gravesii</i> <sup>5</sup> Mountains, w. Texas/Coahuila, Mexico.	T	M	±	—	—	±	+	298

<sup>1</sup> Red oaks have bristle-tipped leaves, inner shell (not cup) of acorns hairy, acorns maturing in 2 years (developing on branchlets as well as twigs), and trunk dark. White oaks have smooth-edged leaves, hairless inner acorn shells, acorns maturing in 1 year on twigs, and trunk bark gray.

<sup>2</sup> P = Pacific Coast region, R = Rocky Mts. and Southwest, T = Texas.

<sup>3</sup> D = deep, M = medium, S = shallow.

<sup>4</sup> Acorn cup saucer-shaped.

<sup>5</sup> See also Shumard Oak, Pl. 35.







CALIFORNIA  
BLACK OAK



OREGON OAK



VALLEY OAK



BLUE OAK



GAMBEL OAK



HAVARD (SHIN) OAK



LACEY OAK



GRAVES OAK



V



OAKS II: EVERGREEN OAKS OF CALIFORNIA  
AND ITS BORDERS

Buds under ¼ in. long, clustered at twig ends; fruits acorns.

Leaves leathery, toothed or not, sometimes prickly, hollylike.

Hybrids common. In s. and w.-cen. Calif., see also *Turbinella* and Dunn oaks (Pl. 34). Twigs illustrated with leaves removed.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length (in.)	Leaves shiny above	Leaves hairy beneath	Buds sharp	Buds hairy	Acorns narrow	White (W) or red (R) oak <sup>2</sup>	Text page
<b>CALIFORNIA SCRUB OAK</b> <i>Quercus dumosa</i> Leaves spiny, no acorn stalks.	c	½-1¼	+	±	+	-	±	W	299
<b>COAST LIVE OAK</b> <i>Q. agrifolia</i> Leaves convex above, wide.	c	1-4	+	-	-	-	+	R	300
<b>INTERIOR LIVE OAK</b> <i>Q. wislizenii</i> Leaves flat, narrow, pointed.	v	1-2	+	-	+	-	+	R	301
<b>CANYON LIVE OAK</b> <i>Q. chrysolepis</i> <sup>4</sup> Acorn cup gold, leaf veins parallel.	m	1-2½	+	±	±	-	±	I	302
<b>ENGELMANN OAK</b> <i>Q. engelmannii</i> Leaves blue-green; sw. Calif.	c	1-3	-	+	-	±	-	W	302
<b>ISLAND LIVE OAK</b> <i>Q. tomentella</i> Leaf veins parallel, cup hairy.	i	1-4	-	±	+	+	-	I	302
<b>TANOAK</b> <i>Lithocarpus densiflorus</i> <sup>3</sup> Leaf veins parallel, cup long-scaled.	c	2-5	-	+	±	+	-	R	303

<sup>1</sup> c = coastal slopes and islands, i = native on s. Calif. islands only, m = mountains, v = interior slopes and valleys.

<sup>2</sup> Red oak group has inner shell (not cup) of acorn hairy, acorns maturing in 2 years (developing on branchlets as well as twigs), trunk dark. White oaks have smooth-edged leaves, hairless inner acorn shells, acorns maturing in 1 year on twigs, and trunk bark gray. I = intermediate oak whose acorns, like those of red oaks, have hairy inner acorn shells (not cups) and require two years to mature. They grow, however, on wood that does not normally produce new growth during the second year and thus appear mature on twigs like white oaks (see p. 299).

<sup>3</sup> *Lithocarpus* has all catkins erect, true oaks (*Quercus*) have drooping male catkins; also sw. Ore.

<sup>4</sup> Also to sw. Ore., w. Nev., w. and cen. Ariz.







CALIFORNIA SCRUB OAK



COAST LIVE OAK



INTERIOR LIVE OAK



CANYON LIVE OAK



ENGELMANN OAK



ISLAND  
LIVE  
OAK



TANOAK



V



## OAKS III: EVERGREEN OAKS OF THE ARID SOUTHWEST

Trees/leaves small, leaves toothed or not. Buds clustered at twig tips. Flowers in catkins, fruits acorns (mostly short-stalked). Hybrids common. See Wavyleaf Oak (Pl. 32), Canyon Live Oak (Pl. 33), Virginia Live Oak (Pl. 35). Some twigs shown with leaves removed.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Maximum leaf length (in.)	Leaves often prickly	Leaf veins much raised <sup>2</sup>	Leaves shiny above	Leaves hairy beneath	White (W) or red (R) oak <sup>3</sup>	Text page
<b>SANDPAPER OAK</b> <i>Quercus pungens</i> <sup>4</sup> Leaves crinkled, rough-hairy.	aT	2	+	-	+	+	W	304
<b>TURBINELLA OAK</b> <i>Q. turbinella</i> <sup>4</sup> Leaves ± flat, acorn stalks ¼–1 ½ in.	w	2	+	-	-	+	W	304
<b>DUNN OAK</b> <i>Q. dunnii</i> <sup>5</sup> Leaves crinkled; cup gold, flared.	cn	2	+	-	±	±	R	305
<b>GRAY OAK</b> <i>Q. grisea</i> Leaves gray-green, mostly pointed.	At	3	-	-	-	±	W	305
<b>NETLEAF OAK</b> <i>Q. rugosa</i> Leaves convex; acorn stalks 1–3 in.	At	3	-	+	+	±	W	306
<b>ARIZONA OAK</b> <i>Q. arizonica</i> Leaves ± blunt, widest near tip.	At	4	-	+	-	±	W	306
<b>MOHR OAK</b> <i>Q. mohriana</i> Leaves white-hairy beneath.	To	4	-	-	+	+	W	307
<b>EMORY OAK</b> <i>Q. emoryi</i> Leaves narrow, shiny both sides.	At	4	-	-	+	-	R	308
<b>SILVERLEAF OAK</b> <i>Q. hypoleucoides</i> Leaves narrow, woolly, edges rolled.	at	4	-	+	+	+	R	309
<b>MEXICAN BLUE OAK</b> <i>Q. oblongifolia</i> Leaves grayish, tips blunt.	an	2	-	+	+	-	W	309
<b>TOUMEY OAK</b> <i>Q. toumeyii</i> Leaves ½–1 in., branchlets flaky.	an	1	-	-	+	-	W	310
<b>(CHISOS OAK</b> <i>Q. graciliformis</i> ) Leaves narrow, coppery, drooping.	t	4	-	-	+	-	R	310
<b>(LATELEAF OAK</b> <i>Q. tardifolia</i> ) Leaves ± lobed, stalks short.	t	4	-	-	+	-	R	310

<sup>1</sup> A = Ariz.; a = se. Ariz.; c = s. Calif., local Ariz.; n = sw. N.M.; o = w. Okla.; T = cen. Texas; t = w. Texas; w = widespread.

<sup>2</sup> On leaf undersides.

<sup>3</sup> See footnote 2, Pl. 33.

<sup>4</sup> Leaves bristle-tipped even though a white oak. See also Valley Oak, p. 295.

<sup>5</sup> Trunk bark light even though a red oak. Now a part of Palmer Oak, a shrubby intermediate oak. See p. 305.





SANDPAPER  
OAK



TURBINELLA  
OAK

DUNN OAK



GRAY  
OAK



NETLEAF  
OAK



ARIZONA OAK



MOHR  
OAK



EMORY OAK



SILVERLEAF  
OAK



MEXICAN  
BLUE  
OAK



TOUMEY  
OAK

V



## OAKS IV: OAKS OF THE GREAT PLAINS

Eastern oaks whose ranges extend west to the plains states (mainly to cen. Texas). Buds clustered at twig tips. Mostly non-evergreen. Fruits are acorns. White oak trunks mostly gray, red oaks dark.

## SPECIES AND REMARKS

SPECIES AND REMARKS	White (W) or red (R) oak <sup>5</sup>	Leaf edge type <sup>1</sup>	Leaves thick, leathery	Leaves hairy beneath	Twigs hairy	Buds hairy	End buds over 1/4 in. <sup>2</sup>	Acorn cup shape <sup>3</sup>	Text page
<b>EASTERN BLACK OAK</b> <i>Quercus velutina</i> Twigs angled, bark ridged; Okla.	R	M	+	±	-	+	+	B	311
<b>BLACKJACK OAK</b> <i>Q. marilandica</i> Twigs angled, bark blocky.	R	S	+	±	+	+	+	B	311
<b>SHUMARD OAK</b> <i>Q. shumardii</i> <sup>6</sup> Buds pale, angled.	R	D	-	±	-	-	+	S	312
<b>BUR OAK</b> <i>Q. macrocarpa</i> Stipules among end buds.	W	D	±	+	±	+	-	U	312
<b>POST OAK</b> <i>Q. stellata</i> Leaves crosslike, bark ± blocky.	W	D	±	+	+	+	-	B	313
<b>DURAND OAK</b> <i>Q. sinuata</i> Leaves vary; buds round.	W	S	+	-	±	±	-	S	313
<b>CHINKAPIN OAK</b> <i>Q. muehlenbergii</i> <sup>4</sup> Teeth sharp, 8-13 pairs; buds pointed.	W	T	-	+	-	-	-	B	314
<b>BLUEJACK OAK</b> <i>Q. incana</i> Leaf undersides whitish; bark ± dark, blocky.	R	N	+	+	±	+	±	S	314
<b>VIRGINIA LIVE OAK</b> <i>Q. virginiana</i> Evergreen, acorn stalks 3/4-1 in. long.	W	N	+	±	-	-	-	B	314

<sup>1</sup> D = deep lobes, M = medium lobes, N = neither lobed nor toothed, S = shallow lobes, T = toothed.

<sup>2</sup> Also angled and pointed.

<sup>3</sup> B = bowl-shaped, S = saucer-shaped, U = unique, cup long-fringed.

<sup>4</sup> Ranging west to w. Okla., se. N.M., and n. Mexico.

<sup>5</sup> See footnote 2, Pl. 33.

<sup>6</sup> See also Buckley Oak, p. 312.





EASTERN BLACK OAK



POST OAK



DURAND OAK



BLACKJACK OAK



CHINKAPIN OAK



SHUMARD OAK



BLUEJACK OAK



BUR OAK



VIRGINIA LIVE OAK





## WILLOWS I: LEAVES VERY NARROW

Willows are catkin-bearing plants with 3 bundle scars and a single, smooth, caplike bud scale mostly with no overlap evident. Willows on this plate have leaves 8–15 times longer than wide, toothed, with V-shaped bases and without stipules or leafstalk glands (note exceptions). See also Pls. 37–39.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaves toothed	Leaves long-pointed	Leaves whitened beneath	Leaves hairy beneath	Leafstalks under ¼ in.	Leaves shade of green <sup>2</sup>	Twigs hairy	Text page
<b>YEWLEAF WILLOW</b> <i>Salix taxifolia</i> Leaves ½–1 ¼ in. long.	S	±	–	–	+	+	G	+	317
<b>SANDBAR WILLOW</b> <i>S. exigua</i> Leaves to ¾ in. wide, sides parallel.	w	+	+	±	±	+	G	±	317
<b>HINDS WILLOW</b> <i>S. hindsiana</i> <sup>3</sup> Leaves to ¾ in. wide, mainly Calif.	P	–	–	±	+	+	G	±	317
<b>NORTHWEST WILLOW</b> <i>S. sessilifolia</i> Leaves wide at middle, teeth few.	P	±	–	–	+	±	G	+	317
<b>RIVER WILLOW</b> <i>S. fluviatilis</i> Leaves long, teeth many; Columbia R. basin.	P	+	+	+	±	+	Y	–	318
<b>BLACK WILLOW</b> <i>S. nigra</i> <sup>4</sup> Leaves green both sides.	PT	+	+	–	–	–	B	–	318
<b>(GOODDING WILLOW</b> <i>S. gooddingii</i> ) <sup>5</sup> Buds show scale edge overlaps.	S	+	+	–	–	–	B	+	319
<b>SATINY WILLOW</b> <i>S. pellita</i> Leaves ± leathery, teeth rare; Sask. east.	C	±	–	+	+	–	B	–	319
<b>WEeping WILLOW</b> <i>S. babylonica</i> <sup>5</sup> Glands ± present; twigs long, droop.	w	+	+	+	±	±	D	±	320

<sup>1</sup> C = Canada/Alaska, P = Pacific states, S = Southwest, T = Texas/Okla. and east, w = widespread.

<sup>2</sup> B = bright-, D = dark-, G = gray-, Y = yellow-green.

<sup>3</sup> Now considered part of Sandbar Willow.

<sup>4</sup> Twigs brittle at the base (snap with fingers).

<sup>5</sup> Leafstalk glands present.





YEWLEAF  
WILLOW



SANDBAR  
WILLOW



HINDS  
WILLOW



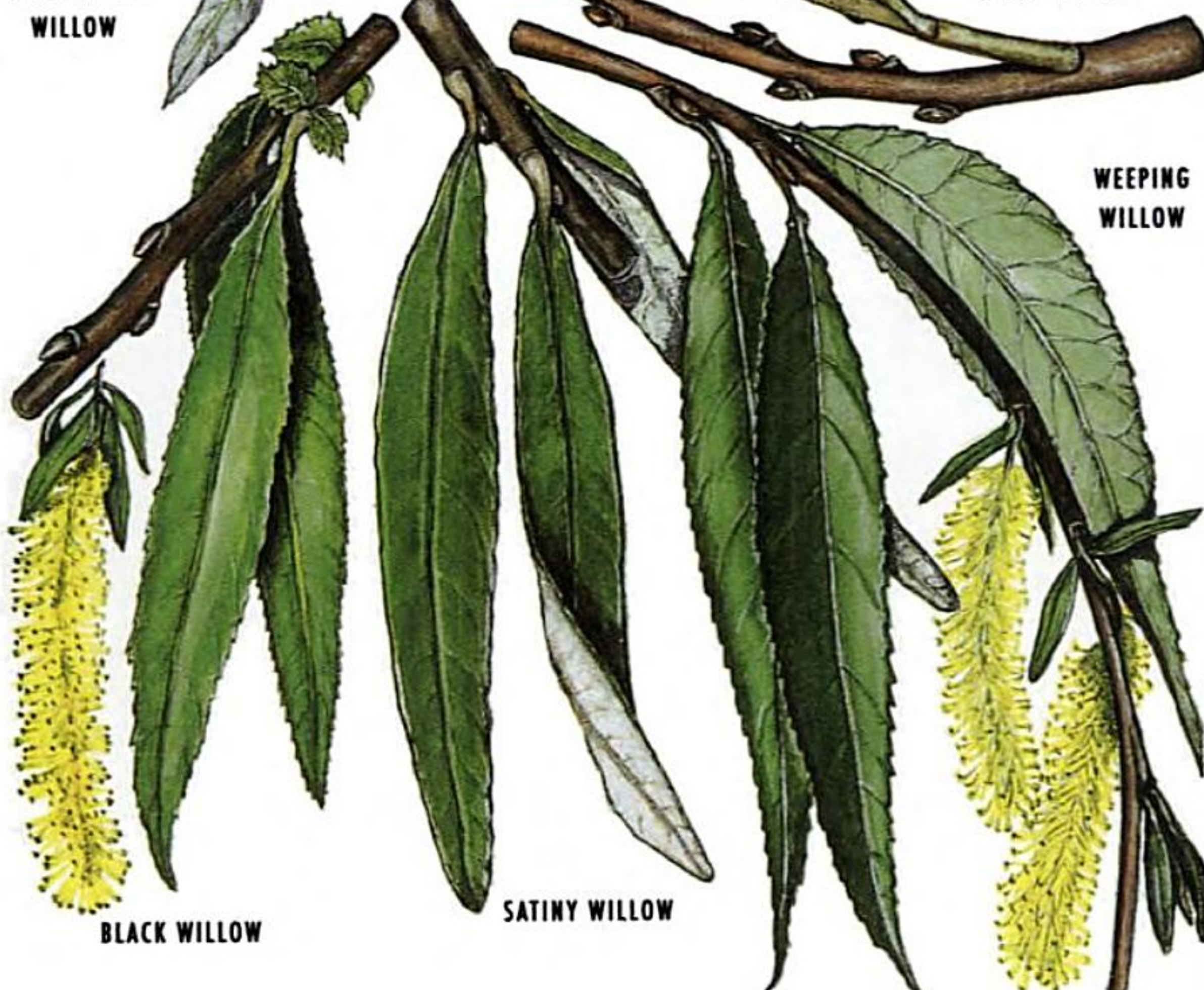
NORTHWEST  
WILLOW



RIVER WILLOW



WEeping  
WILLOW



BLACK WILLOW

SATINY WILLOW

V



## WILLOWS II: LEAVES OF INTERMEDIATE WIDTH

Willows of this plate have leaves 5–7 times longer than wide, mostly deciduous, fine-toothed, whitened beneath, and without stipules, leafstalk glands, or evident bud scale overlap. Northwest Willow (Pl. 36) and Littletree Willow (Pl. 38) sometimes have medium-narrow leaves. See Pl. 36 for group characteristics and Pl. 39 for nonwillows with slim leaves. In the Rocky Mts., Narrowleaf Cottonwood (Pl. 31) is willow-like in appearance and habitat.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaves long-pointed	Leaves hairy beneath	Leaf base V-shaped	Leaves shade of green <sup>2</sup>	Text page
<b>WHITE WILLOW</b> <i>Salix alba</i> Leaves ± whitish both sides, leafstalk glands.	W	±	+	+	G	320
<b>MEADOW WILLOW</b> <i>S. petiolaris</i> Local, n. plains area; young leaves dry black.	CR	+	—	+	D	321
<b>GEYER WILLOW</b> <i>S. geyeriana</i> Leaves dull, without teeth, often blunt, stalks short.	PR	—	±	+	D	321
<b>PACIFIC WILLOW</b> <i>S. lucida</i> Glands on leaf bases or stalks, stalks long.	PR	+	—	—	D	322
<b>ARROYO WILLOW</b> <i>S. lasiolepis</i> Leaves thick, teeth rare, tips ± rounded.	PR	—	±	+	D	322
<b>BONPLAND WILLOW</b> <i>S. bonplandiana</i> Leaves thick, ± evergreen, tips pointed.	PS	±	±	±	Y	323
<b>(RED WILLOW</b> <i>S. laevigata</i> ) Buds show scale edge overlap.	PS	±	±	±	R	323
<b>MACKENZIE WILLOW</b> <i>S. mackenzieana</i> Leaves ± heart-based, stipules ± present.	CR	—	—	—	Y	323
<b>COASTAL PLAIN WILLOW</b> <i>S. caroliniana</i> Twigs ± hairy, bases brittle; stipules ±.	TE	+	—	—	Y	324
<b>PEACHLEAF WILLOW</b> <i>S. amygdaloides</i> Twigs hairless, ± droop; also n. plains and nw. U.S.	RE	+	—	—	Y	324

<sup>1</sup> C = Canada/Alaska, E = e. U.S., P = Pacific states and B.C., R = Rocky Mts., S = Southwest, T = cen. Texas/cen. Okla., w = widespread.

<sup>2</sup> D = dark green, G = gray-green, R = reddish, Y = yellow-green.









# WILLOWS III: LEAVES RELATIVELY WIDE

These willows usually have leaves 2-4 times longer than wide and mostly without leafstalk glands. Northwest Willow (Pl. 36) may have some wide leaves. See Pl. 36 for group field marks. See also Pls. 37 and 39.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaves toothed	Leaves hairy beneath	Leaf base V-shaped	Stipules usually present	Leaves shade of green <sup>2</sup>	Twigs brittle-based <sup>3</sup>	Text page
<b>SHINING WILLOW</b> <i>Salix lucida</i> Leaves long-pointed, glands present. <sup>3, 9</sup>	E	+	-	-	+	Y	+	325
<b>PUSSY WILLOW</b> <i>S. discolor</i> Leaf teeth coarse, stalks over 1/2 in.	CE	±	-	±	+	B	-	325
<b>LITTLETREE WILLOW</b> <i>S. arbusculoides</i> Leaf teeth fine, twigs ± hairy.	C	+	+	+	-	D	-	326
<b>BALSAM WILLOW</b> <i>S. pyrifolia</i> Leaves spicy; B.C./Yukon east.	C	+	±	-	-	D	-	326
<b>FELTLEAF WILLOW</b> <i>S. alaxensis</i> Twigs thick white-woolly; far north.	C	-	+	+	+	Y	-	326
<b>SITKA WILLOW</b> <i>S. sitchensis</i> <sup>4, 5, 9</sup> Leaves silver-silky beneath.	P	-	+	+	+	B	+	327
<b>SCOULER WILLOW</b> <i>S. scouleriana</i> <sup>5</sup> Leaves blunt, red-hairy, wavy-edged.	w	±	+	+	+	D	-	328
<b>BEBB WILLOW</b> <i>S. bebbiana</i> Leaves gray-hairy, teeth coarse. <sup>6</sup>	CR	±	+	+	+	G	-	328
<b>HOOKE WILLOW</b> <i>S. hookeriana</i> <sup>7, 9</sup> Leaves white-woolly; near ocean.	P	±	+	-	-	D	+	328
<b>TRACY WILLOW</b> <i>S. tracyi</i> <sup>8</sup> River sandbars; leafstalks under 1/4 in.	P	±	±	+	-	B	-	329

<sup>1</sup> C = Canada/Alaska, E = e. U.S., P = Pacific states and B.C., R = Rocky Mts., w = widespread.

<sup>2</sup> B = blue-, D = dark-, G = gray-, Y = yellow-green.

<sup>3</sup> Species of n. plains; use lens.

<sup>4</sup> Also local n. Rocky Mts.

<sup>5</sup> Leaf edges strongly rolled under.

<sup>6</sup> Leafstalks 1/4-3/8 in. long.

<sup>7</sup> S. Alaska to n. Calif.

<sup>8</sup> Nw. Calif./sw. Ore. Recently judged to be part of Arroya Willow (Pl. 37).

<sup>9</sup> Twigs snap off easily at the base.





SHINING  
WILLOW

PUSSY  
WILLOW

LITTLETREE  
WILLOW

SITKA WILLOW

FELTLEAF WILLOW

HOOVER  
WILLOW

BEBB  
WILLOW

TRACY  
WILLOW

SCOULER  
WILLOW

ALSAM  
WILLOW

V



## NONWILLOWS WITH NARROW WILLOWLIKE LEAVES

Leaf length 3–15 times width; buds lacking the single caplike scale of willows. First five species evergreen.

Narrowleaf Cottonwood (Pl. 31),  
Fire and Black cherries (Pl. 42),  
Arizona Madrone (Pl. 45), and  
Bluegum Eucalyptus (Pl. 46) also  
have leaves sometimes narrow.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length (in.)	Leaf teeth <sup>2</sup>	Leaves long-pointed	Leaf base V-shaped	Flower color <sup>3</sup>	Fruit type <sup>4</sup>	Fruit length (in.)	Text page
<b>CALIFORNIA-BAY</b> <i>Umbellularia californica</i> Leaves spicy, no bud scales; sw. Ore./Calif.	P	3–5	N	–	±	Y	F	¾–1	330
<b>GOLDEN CHINKAPIN</b> <i>Chrysolepis chrysophylla</i> <sup>5</sup> Leaves not spicy, gold beneath; buds scaly.	P	3–5	N	±	±	W	B	1–1½	331
<b>PACIFIC BAYBERRY</b> <i>Myrica californica</i> <sup>5</sup> Leaves aromatic, resin dots beneath. <sup>6</sup>	P	3–4	CN	–	+	G	W	¼	332
<b>(SOUTHERN BAYBERRY</b> <i>Myrica cerifera</i> ) Aromatic, resin dots both sides. <sup>6</sup>	E	2–3	CN	±	+	G	W	¼	333
<b>TORREY VAUQUELINIA</b> <i>Vauquelinia californica</i> Leaves parallel-sided; Ariz./ Baja California.	S	2–4	C	–	+	W	D	¼	333
<b>JUMPING-BEAN SAPIUM</b> <i>Sapium biloculare</i> Sap milky, poisonous. <sup>5</sup>	S	1–2	F	–	–	G	D	½	334
<b>DESERT-WILLOW</b> <i>Chilopsis linearis</i> Leaves/fruits slim, flowers showy, pods persist.	BS	3–7	N	+	+	W	P	4–12	334
<b>RUSSIAN-OLIVE</b> <i>Elaeagnus angustifolius</i> Leaves, twigs, fruits silver-scaly; ± thorny.	wl	1–4	N	–	±	Y	F	½	335
<b>PEACH</b> <i>Prunus persica</i> Fruits velvety; Calif.	Pl	3–6	F	+	±	P	F	1–4	335

<sup>1</sup> B = Great Basin; E = se. U.S. to Texas; I = introduced from abroad, naturalized;  
P = Pacific states and B.C.; S = Southwest; w = widespread.

<sup>2</sup> C = coarse, F = fine, N = none.

<sup>3</sup> G = greenish, P = pink, W = white, Y = yellow.

<sup>4</sup> B = bur, prickly; D = dry, brownish; F = fleshy; P = slender, dry pod; W = waxy.

<sup>5</sup> Leaves clustered at or near twig tips.

<sup>6</sup> Use lens.





CALIFORNIA-BAY



GOLDEN  
CHINKAPIN



PACIFIC  
BAYBERRY



TORREY  
VAUQUELINIA



JUMPING-BEAN  
SAPIUM



DESERT-  
WILLOW



RUSSIAN-OLIVE



PEACH



TREES WITH CATKINS THAT RESEMBLE  
SMALL CONES: ALDERS

Primarily northern plants, mostly of stream-sides and damp soils. Leaves largely double-toothed and 2–5 in. long with main side veins parallel. Buds mostly stalked, reddish, blunt, ¼–⅜ in. and with 2–3 scales not overlapping. Bundle scars 3. Cones mostly ½–¾ in. long. California Hazelnut (Pl. 41) also has alderlike leaves.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf teeth single/double	Leaf tooth shape <sup>2</sup>	Leaf vein pairs	Length of mature buds <sup>3</sup>	Trunk bark <sup>4</sup>	Text page
<b>RED ALDER</b> <i>Alnus rubra</i> Leaf edges rolled under. <sup>5</sup>	P	D	C	10–15	+	G	336
<b>WHITE ALDER</b> <i>A. rhombifolia</i> Leaves single-toothed, edges flat.	P	SD	F	9–12	±	G	337
<b>SITKA ALDER</b> <i>A. viridis</i> ssp. <i>sinuata</i> <sup>6</sup> Leaves shiny beneath; buds pointed.	PR	D	L	6–10	+	G	338
<b>MOUNTAIN ALDER</b> <i>A. incana</i> ssp. <i>tenuifolia</i> None of above; veinlets in network. <sup>5</sup>	PR	D	F	6–9	±	D	339
<b>SPECKLED ALDER</b> <i>A. rugosa</i> Veinlets parallel, ladderlike. <sup>5</sup>	C	D	F	9–12	±	D	339
<b>ARIZONA ALDER</b> <i>A. oblongifolia</i> Leaves narrow, base V-shaped.	S	D	F	9–13	+	C	340
<b>SEASIDE ALDER</b> <i>A. maritima</i> Bud scales separated; s. Okla. <sup>7</sup>	O	S	C	5–7	–	D	340

<sup>1</sup> C = Canada, O = Okla., P = Pacific states and B.C., R = Rocky Mts., S = South-west.  
<sup>2</sup> C = coarse, F = fine, L = long-pointed, very fine.  
<sup>3</sup> – = under ¼ in., ± = ¼–⅜ in., + = over ⅜ in. long.  
<sup>4</sup> C = checkered small plates; D = dark, usually with short whitish horizontal streaks (lenticels); G = gray.  
<sup>5</sup> Use lens.  
<sup>6</sup> Cone stalks as thin as leafstalks and as long as cones; buds not stalked, scales overlap.  
<sup>7</sup> Also Md./Del.







RED ALDER



WHITE ALDER



SITKA ALDER



MOUNTAIN ALDER



SPECKLED ALDER



ARIZONA  
ALDER



SEASIDE ALDER



OTHER TREES WITH ALTERNATE LEAVES  
MOSTLY DOUBLE-TOOTHED<sup>1</sup>

Birches have smooth bark with horizontal streaks, spur branches, and buds with 2–3 scales. Other species have dark rough bark, no spurs, and 6–8 bud scales. Elms have fibrous inner bark and mostly uneven-based, sandpapery leaves. All have 3 bundle scars and a false end bud.

## SPECIES AND REMARKS

	Major distribution <sup>2</sup>	Leaf length (in.)	Leaves long-pointed	Fruit type <sup>3</sup>	Text page
<b>PAPER BIRCH</b> <i>Betula papyrifera</i> Trunk white, peeling, dark streaks. <sup>4</sup>	C	2–4	±	C	341
<b>(ALASKA WHITE BIRCH</b> <i>Betula neoalaskana</i> ) Twig resin-glands large, dense.	C	2–3	±	C	342
<b>(KENAI BIRCH</b> <i>Betula kenaica</i> ) Twig resin-glands few.	A	1–2	–	C	342
<b>WATER BIRCH</b> <i>Betula occidentalis</i> Trunk brown, not peeling, white streaks.	w	2–3	–	C	343
<b>KNOWLTON HORNBEAM</b> <i>Ostrya knowltonii</i> Leaves egg-shaped, fruit clusters 1–2 in. long.	S	1–3	–	S	343
<b>(CHISOS HORNBEAM</b> <i>Ostrya chisosensis</i> ) Leaves elliptic, fruit clusters ½–1 in.; Big Bend, Chisos Mts., w. Texas.	T	1–3	–	S	343
<b>(EASTERN HORNBEAM</b> <i>Ostrya virginiana</i> ) Leaves long-pointed, fruit clusters 2–2½ in.	E	2–5	+	S	343
<b>CALIFORNIA HAZELNUT</b> <i>Corylus cornuta</i> ssp. <i>californica</i> Leaves hairy, round, heart-based.	P	2–4	–	B	344
<b>AMERICAN ELM</b> <i>Ulmus americana</i> Trunk divided, bud scales dark-edged.	E	4–6	±	W	344
<b>(SLIPPERY ELM</b> <i>Ulmus rubra</i> ) Buds red-hairy, twigs rough-hairy.	E	4–8	±	W	345
<b>CEDAR ELM</b> <i>Ulmus crassifolia</i> <sup>5</sup> Leaves small, buds brown, fall-flowering.	T	1–2	–	W	345
<b>(WINGED ELM</b> <i>Ulmus alata</i> ) <sup>5</sup> Leaves small, smooth; buds dark-edged; spring-flowering.	E	1–2	–	W	346
<b>SIBERIAN ELM</b> <i>Ulmus pumila</i> Leaves ± single-toothed; buds dark.	lw	1–3	–	W	346

<sup>1</sup> Except Siberian Elm.<sup>2</sup> A = Alaska, C = Canada; E = e. U.S. to plains; l = introduced, foreign; S = Southwest; T = Texas; w = widespread.<sup>3</sup> B = beaked nuts; C = catkins; S = sacs, inflated, containing flat nuts; W = winged, flat, ± circular.<sup>4</sup> Broken horizontal lines (lenticels) on bark; see also Weeping Birch, p. 342.<sup>5</sup> Corky wings may occur on some branchlets.

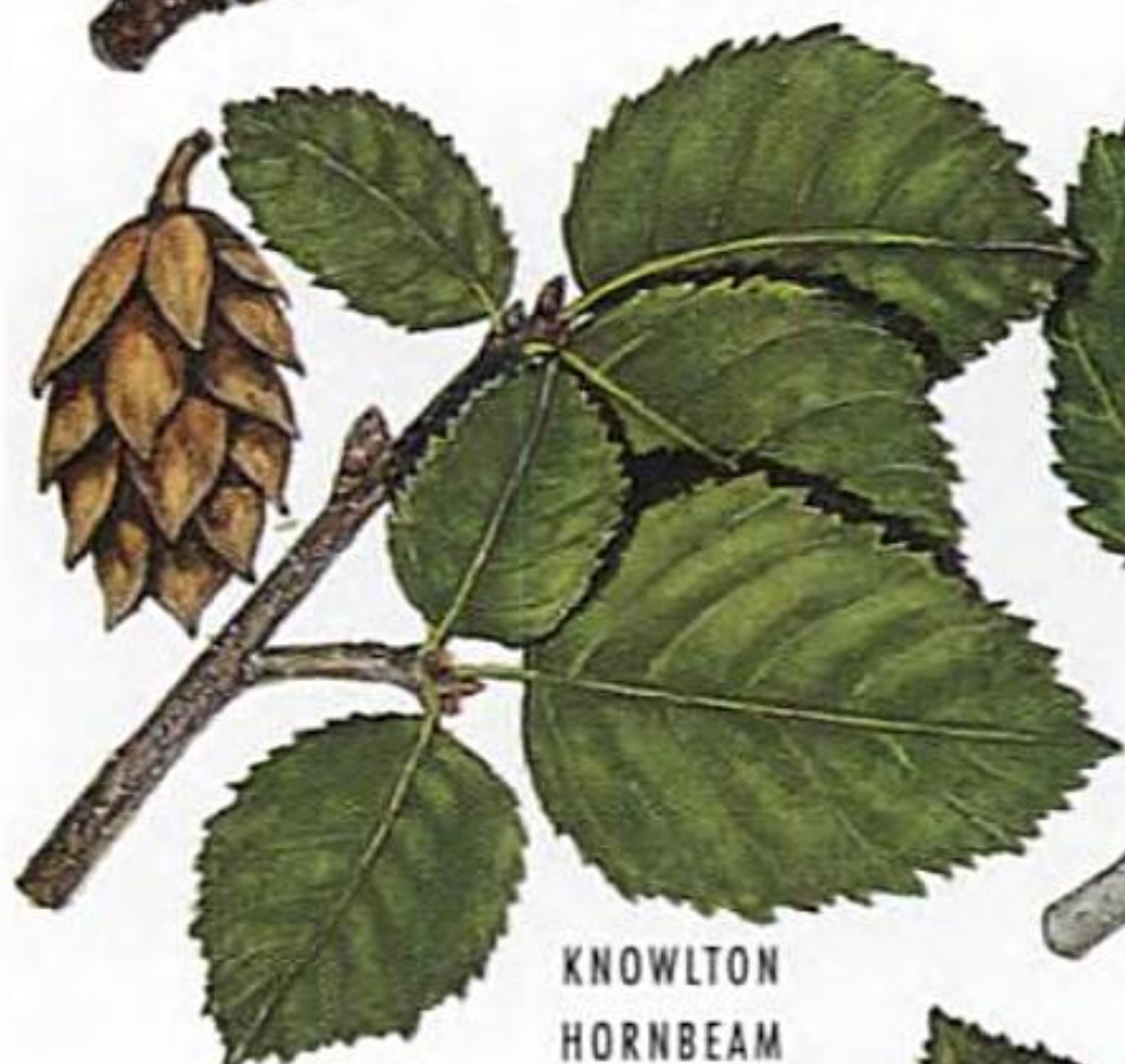




PAPER BIRCH



WATER BIRCH



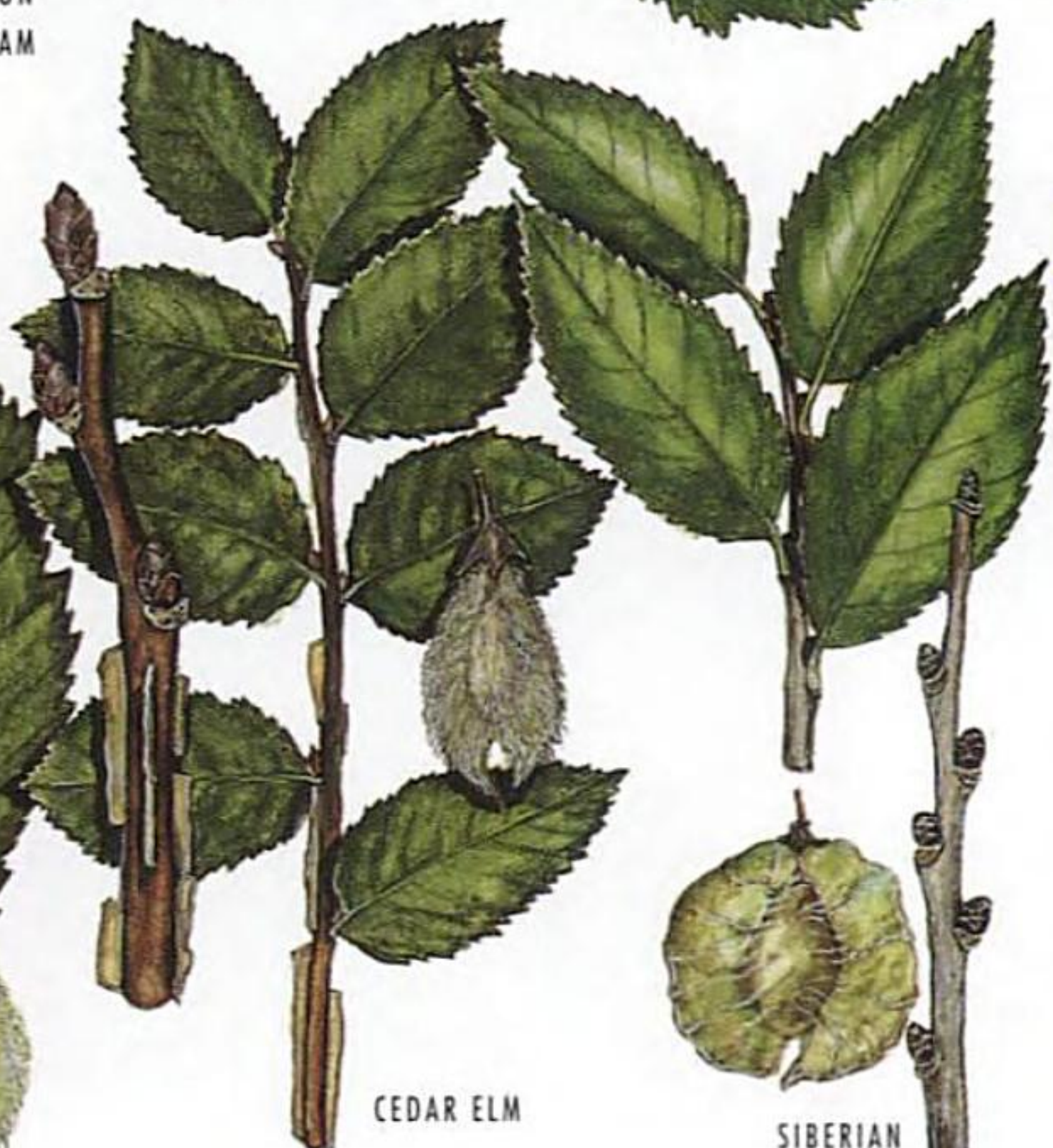
KNOWLTON  
HORNBEAM



CALIFORNIA  
HAZELNUT



AMERICAN ELM



CEDAR ELM



SIBERIAN  
ELM

V



## CHERRIES AND THORNLESS PLUMS

Trees with single- or double-toothed alternate leaves; leafstalks or leaf bases with tiny paired glands. Twigs mostly hairless; broken twigs with a sour almondlike odor. End buds false in plums. Bundle scars 3. Except Chokecherry and Black Cherry,<sup>4</sup> flower/fruit clusters umbrella-shaped on spur branches. Fruits single-seeded. Other *Prunus* species are on Pls. 27, 39, 44, and 45.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length (in.)	Leaves narrow <sup>2</sup>	Leaves double-toothed	Leaf teeth sharp	Fruit color <sup>3</sup>	Text page
<b>BITTER CHERRY</b> <i>Prunus emarginata</i> Leaves $\pm$ round-pointed.	PR	1-3	$\pm$	-	$\pm$	RB	348
<b>CHOKECHERRY</b> <i>P. virginiana</i> <sup>4</sup> Leaves wide, bud scales rounded.	w	2-5	-	-	+	P	348
<b>BLACK CHERRY</b> <i>P. serotina</i> <sup>4</sup> Leaves narrow, bud scales pointed.	SE	2-6	+	-	-	B	349
<b>FIRE CHERRY</b> <i>P. pensylvanica</i> Leaves/buds crowded at twig tips.	CE	2-5	+	-	+	R	350
<b>SWEET CHERRY</b> <i>P. avium</i> 10-14 vein pairs, spurs leafless.	IP	2-6	-	+	$\pm$	RB	350
<b>SOUR CHERRY</b> <i>P. cerasus</i> <sup>5</sup> 6-8 pairs of veins, spurs leafy.	IP	2-5	-	+	-	R	351
<b>MAHALEB CHERRY</b> <i>P. mahaleb</i> Leaves often round, twigs hairy.	IP	1-3	-	-	-	B	351
<b>GARDEN PLUM</b> <i>P. domestica</i> Leaves not round, twigs hairless.	IP	2-4	-	-	-	P	351
<b>MEXICAN PLUM</b> <i>P. mexicana</i> Seed round; west to cen./s. Texas.	E	2-4	-	+	+	RP	352
<b>WILDGOOSE PLUM</b> <i>P. munsoniana</i> Seed pointed; west to cen. Texas.	E	3-6	-	-	-	RP	352

<sup>1</sup> C = Canada, E = e. U.S., I = introduced from abroad, P = Pacific Slope, R = Rocky Mts., S = Southwest, w = widespread.

<sup>2</sup> See also Peach, Pl. 39.

<sup>3</sup> B = black, P = purple, R = red, Y = yellow.

<sup>4</sup> Flower/fruit clusters finger-shaped, spurs lacking.

<sup>5</sup> Main central trunk lacking.







BITTER CHERRY



CHOCKECHERRY



BLACK CHERRY



FIRE CHERRY



SWEET CHERRY



SOOR CHERRY



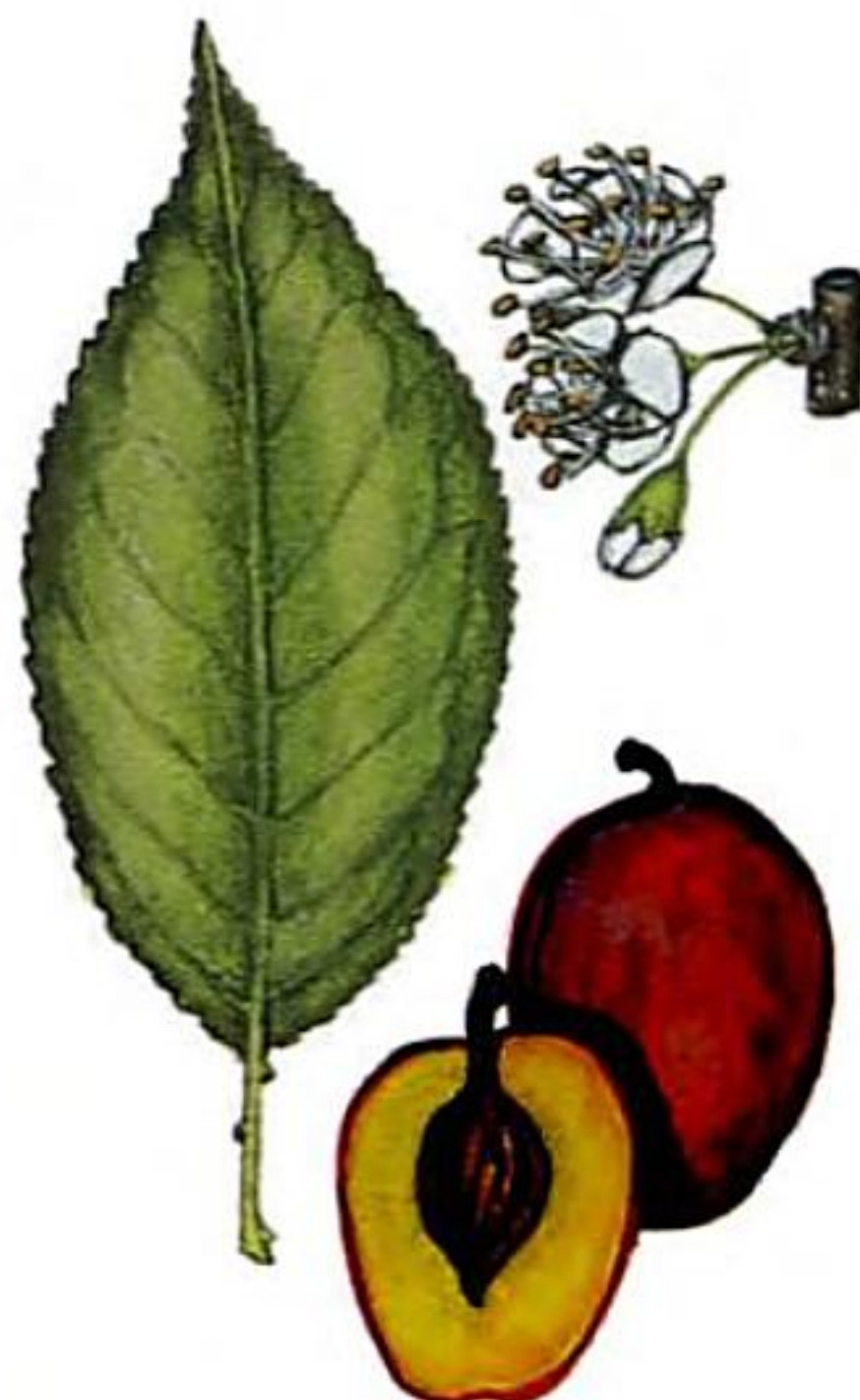
MAHALEB CHERRY



GARDEN PLUM



MEXICAN PLUM



WILDGOOSE PLUM



# MISCELLANEOUS TREES WITH ALTERNATE LEAVES THIN, NOT LEATHERY

Leaves with single teeth or none, tips  $\pm$  blunt. First 5 species with parallel veins. Tree Tobacco  $\pm$  evergreen. Buckthorns of this plate lack bud scales. All fleshy fruits here are several-seeded. White and Seaside alders (Pl. 40) and Siberian Elm (Pl. 41) have single teeth. Texas Persimmon (Pl. 46) is deciduous in some areas of that state.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length (in.)	Leaf teeth <sup>2</sup>	Spur branches common <sup>3</sup>	Flower color <sup>4</sup>	Fruits fleshy <sup>5</sup>	Text page
<b>WESTERN (SASKATOON) JUNE BERRY</b> <i>Amelanchier alnifolia</i> Leaves round, stalks $\frac{1}{2}$ -1 in. long.	W	1-3	C	+	W	P	353
<b>UTAH JUNE BERRY</b> <i>Amelanchier utahensis</i> Leaves round, stalks $\frac{1}{4}$ - $\frac{1}{2}$ in. long.	RB	$\frac{1}{2}$ -1 $\frac{1}{4}$	C	+	W	P	354
<b>(ALDERLEAF CERCOCARPUS)<sup>6</sup></b> <i>Cercocarpus montanus</i> Leaves resemble <i>C. betuloides</i> , Pl. 44.	RB	1-1 $\frac{1}{2}$	C	+	G	-	354
<b>CASCARA BUCKTHORN</b> <i>Rhamnus purshiana</i> Leaves hairless, vein pairs 10-15.	PR	3-6	WF	-	G	B	355
<b>BIRCHLEAF BUCKTHORN</b> <i>Rhamnus betulifolia</i> Leaves $\pm$ hairy, vein pairs 7-10.	S	3-6	F	-	G	B	355
<b>(CAROLINA BUCKTHORN</b> <i>Rhamnus caroliniana</i> ) Leaves hairless, vein pairs 8-11.	E	2-6	F	-	G	B	356
<b>DOMESTIC APPLE</b> <i>Malus sylvestris</i> Tree crown broad, thorns uncommon.	PI	1-4	F	+	WP	GR	356
<b>DOMESTIC PEAR</b> <i>Pyrus communis</i> Tree crown narrow, thorns occasional.	PI	1-3	F	+	W	G	357
<b>(INDIAN-PLUM</b> <i>Oemleria cerasiformis</i> ) Leaf base narrowly V-shaped.	P	2-5	N	-	W	$\pm$	357
<b>TREE TOBACCO</b> <i>Nicotiana glauca</i> Leaves long-stalked, white-powdered.	PT	2-8	N	-	Y	-	357
<b>AMERICAN SMOKE TREE</b> <i>Cotinus obovatus</i> Leaves blunt, bundle scars 3, wood yellow.	E	3-6	N	-	B	-	358
<b>POSSUMHAW HOLLY</b> <i>Ilex decidua</i> Side twigs stiff, bundle scar 1.	E	2-3	W	+	G	R	358

<sup>1</sup> B = Great Basin; E = e. U.S. to cen. Texas; I = introduced, local; P = Pacific states and B.C.; R = Rocky Mts.; S = Southwest; T = Texas; w = widespread.

<sup>2</sup> C = coarse, F = fine, N = none, W = wavy-toothed.

<sup>3</sup> Especially on older wood.

<sup>4</sup> B = brownish, G = greenish, P = pink, W = white, Y = yellow.

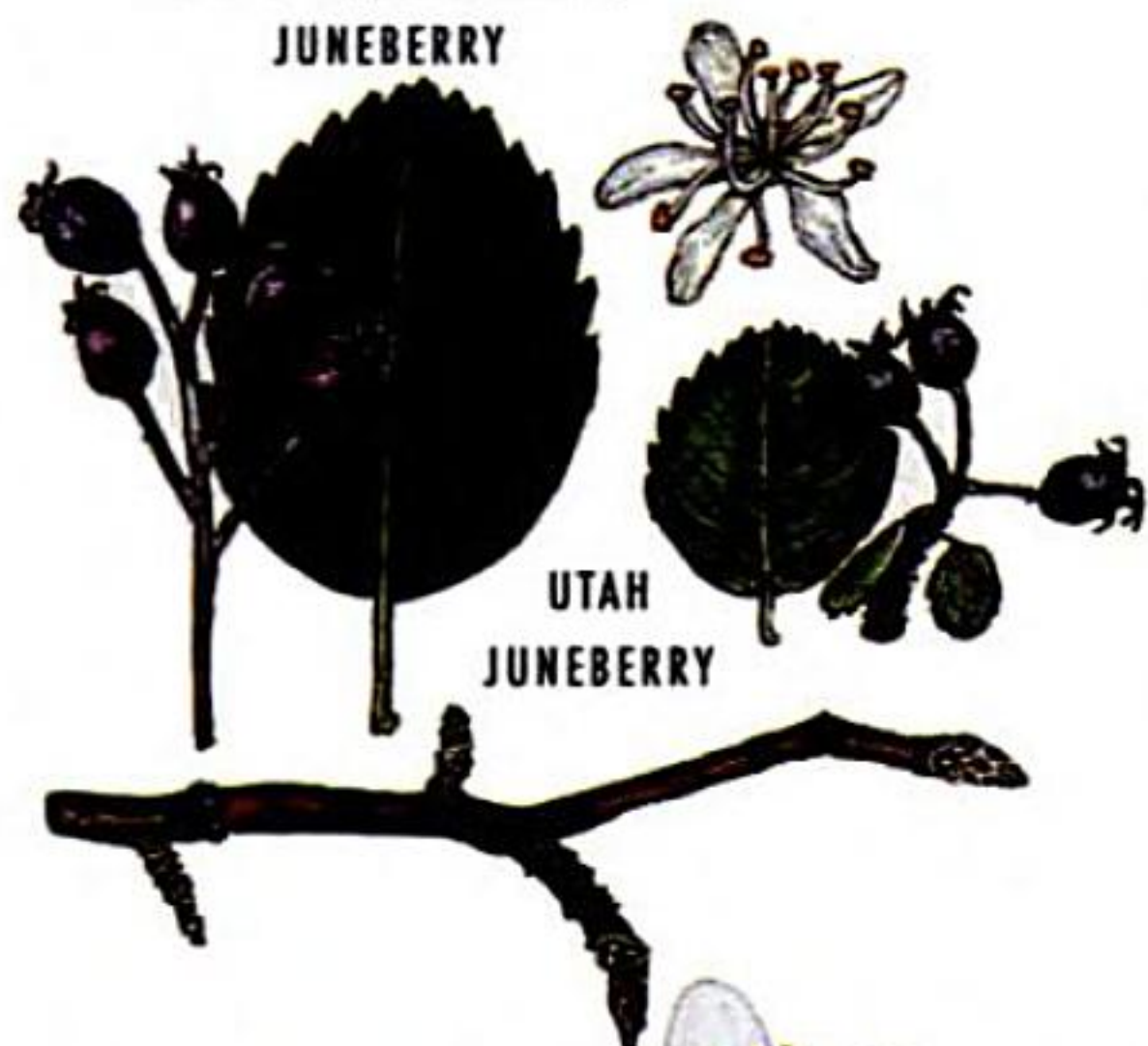
<sup>5</sup> B = black; G = green; P = purple; R = red; - = small, dry, not fleshy.



<sup>6</sup> Rarely tree size.



WESTERN (SASKATOON)  
JUNEBERRY



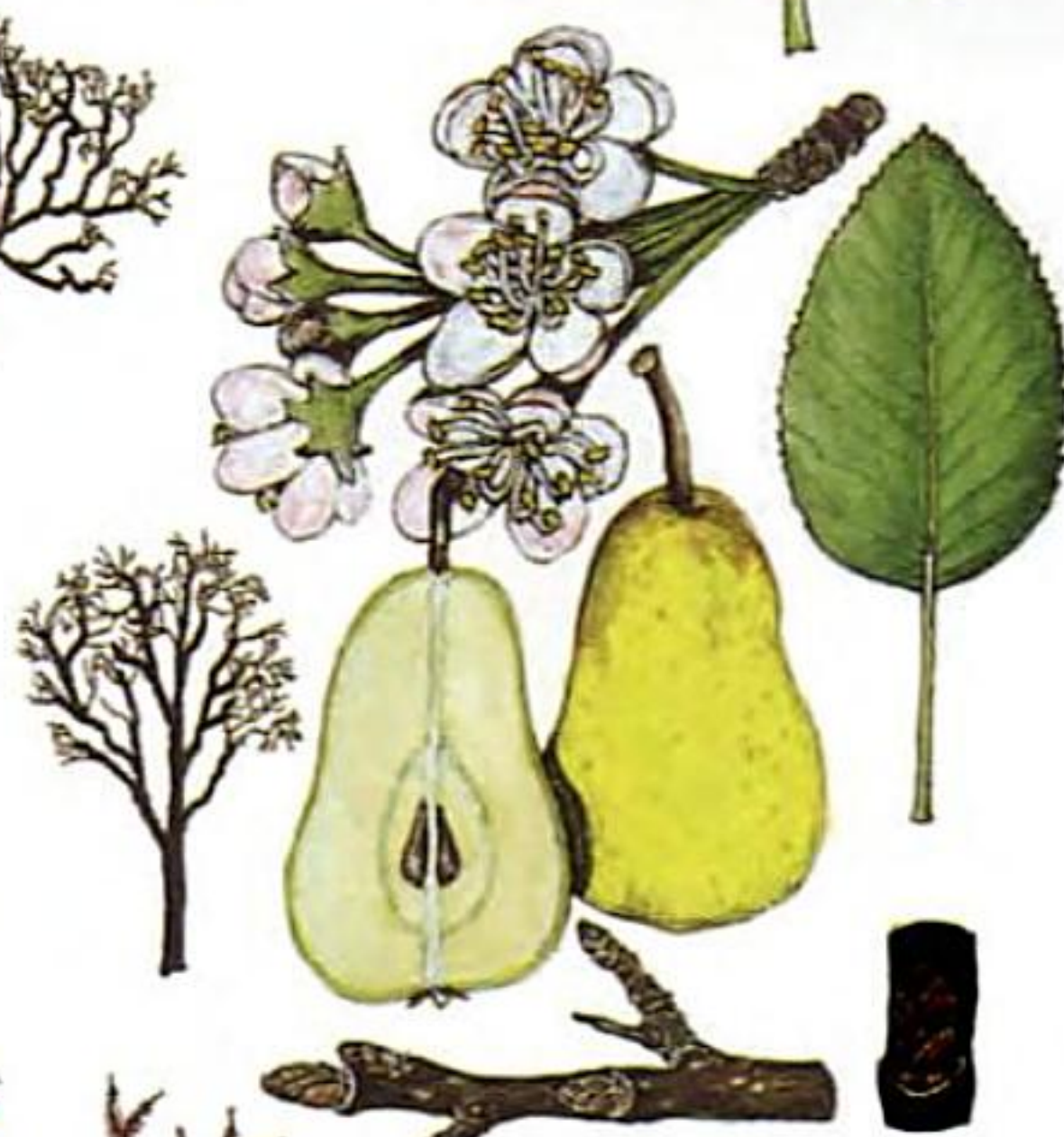
UTAH  
JUNEBERRY

CASCARA  
BUCKTHORN

BIRCHLEAF  
BUCKTHORN



DOMESTIC APPLE



DOMESTIC PEAR



TREE TOBACCO



AMERICAN  
SMOKETREE



POSSUMHAW  
HOLLY

V



TREES WITH ALTERNATE EVERGREEN LEAVES  
TOOTHED

Leaves leathery, mostly with sharp teeth, some prickly. Cercocarpaceae have leaf teeth near the tips, parallel veins, and fruits with 1–4-in. feathery tails. Flowers whitish and (except Cliffrose) small. Fruits mostly 1-seeded. See also ceanothus (pl. 28, 30), Hollyleaf Buckthorn (Pl. 27), some oaks (Pls. 33, 34), narrow-leaved trees (Pl. 39), and sometimes-toothed species (Pl. 45).

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length <sup>2</sup>	Leaf bases V-shaped	Leaves hairy beneath	Spur branches present	Text page
<b>TOYON</b> <i>Heteromeles arbutifolia</i> Not prickly; red fruits in winter, 1–4 seeds.	P	+	±	–	–	359
<b>HOLLYLEAF CHERRY</b> <i>Prunus ilicifolia</i> Leaves prickly, net-veined.	P	±	–	–	±	360
<b>BIRCHLEAF CERCOARPUS</b> <i>Cercocarpus betuloides</i> <sup>3</sup> Leaf edges flat, flowers/fruits 2–5 per cluster.	PS	–	+	±	+	361
<b>CATALINA CERCOARPUS</b> <i>Cercocarpus traskiae</i> Leaf edges flat, flowers/fruits 1–few per cluster.	P	±	±	+	+	361
<b>HAIRY CERCOARPUS</b> <i>Cercocarpus breviflorus</i> <sup>4</sup> Leaf edges rolled, flowers/fruits single.	S	–	+	+	+	361
<b>CLIFFROSE</b> <i>Cowania mexicana</i> Leaves 3–5-lobed, white-woolly, sticky.	SR	o	+	+	+	362
<b>BIG SAGEBRUSH</b> <i>Artemisia tridentata</i> Leaves V-shaped, narrow, 3–5 end teeth.	w	–	+	+	–	363
<b>AMERICAN HOLLY</b> <i>Ilex opaca</i> Christmas holly; leaves spiny.	E	+	–	–	±	363
<b>YAUPON HOLLY</b> <i>Ilex vomitoria</i> Leaves small, blunt, wavy-edged.	E	–	±	–	±	364

<sup>1</sup> E = e. U.S. to cen. Texas, P = Pacific Slope (Calif. foothills and islands), R = Rocky Mts., S = Southwest, w = widespread.

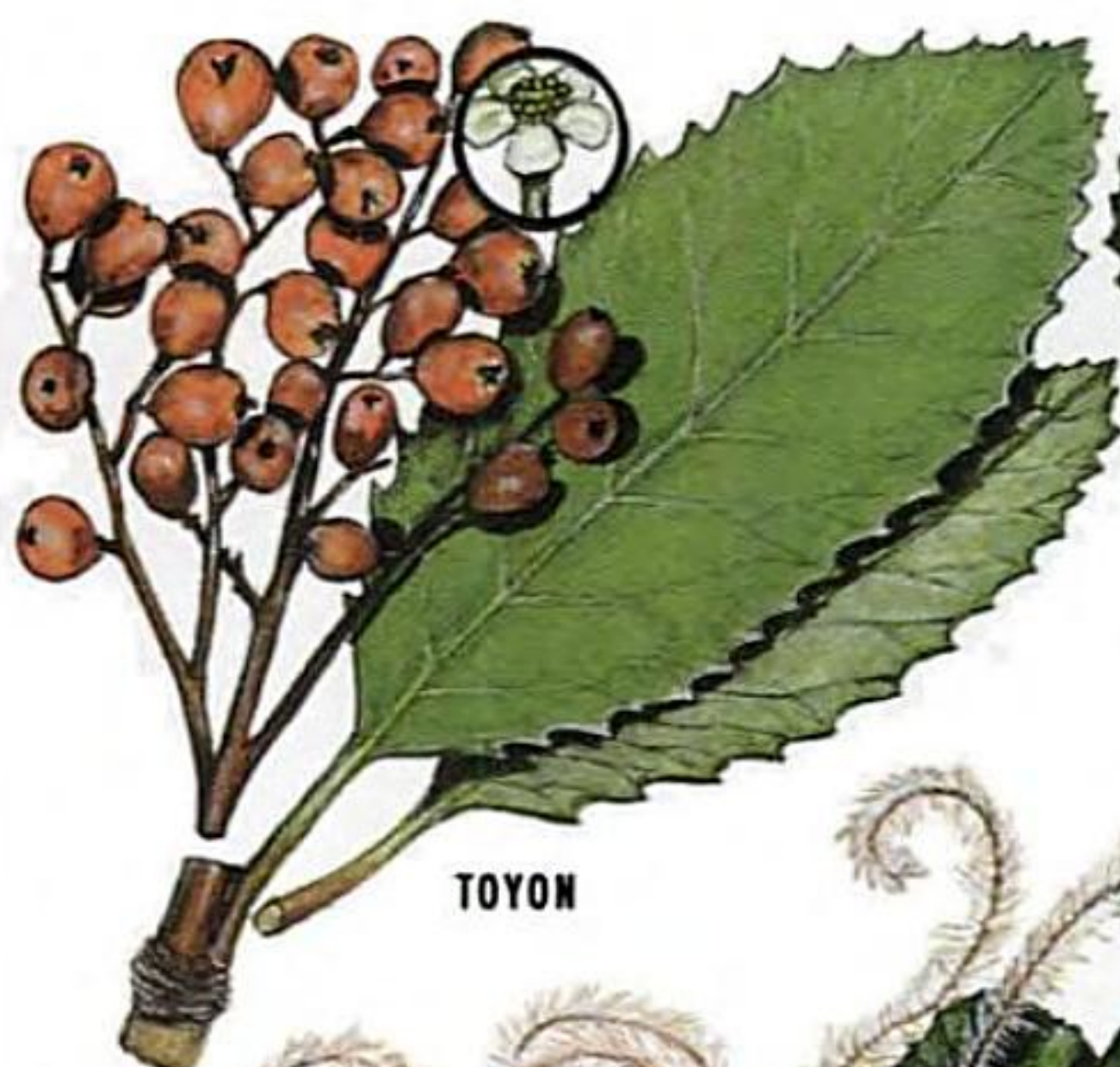
<sup>2</sup> o = 1/4–1/2 in., – = 1/2–1 1/2 in., ± = 1 1/2–3 in., + = 2–5 in.

<sup>3</sup> North to sw. Ore.

<sup>4</sup> Some leaves not toothed.







TOYON



HOLLYLEAF  
CHERRY



BIRCHLEAF  
CERCOCARPUS



CATALINA  
CERCOCARPUS



HAIRY  
CERCOCARPUS



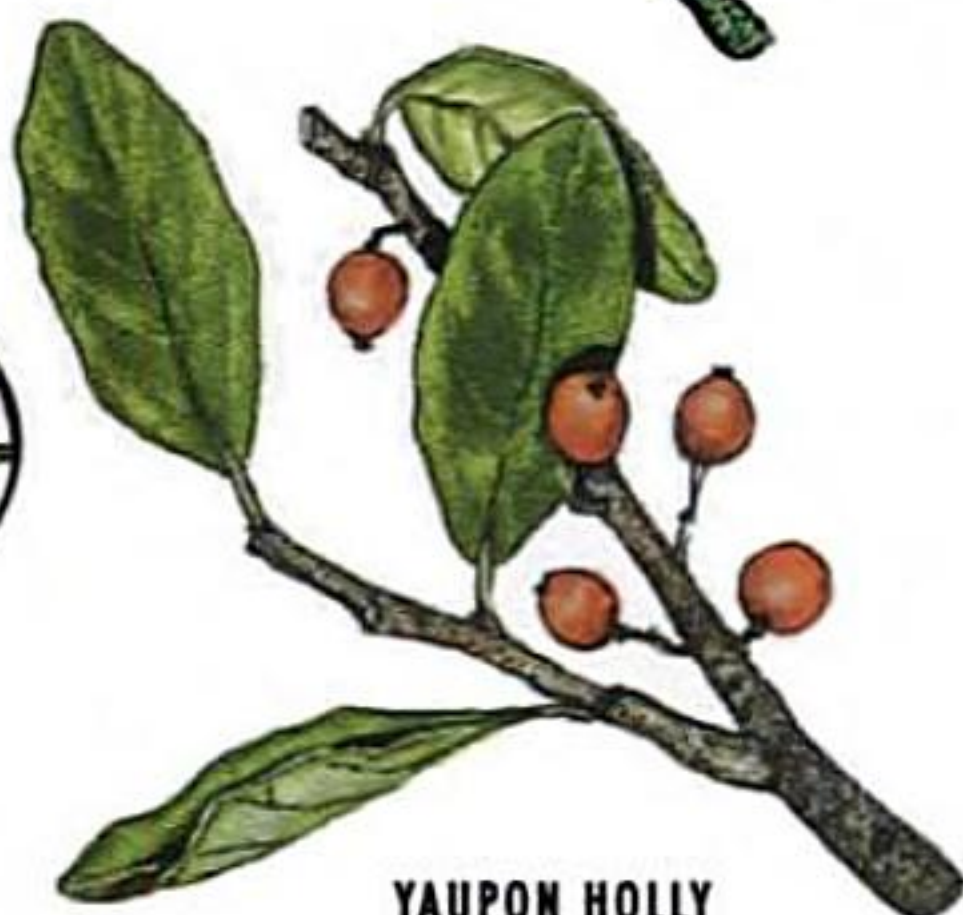
CLIFFROSE



BIG  
SAGEBRUSH



AMERICAN HOLLY



YAUPON HOLLY



TREES WITH ALTERNATE EVERGREEN LEAVES  
SOMETIMES TOOTHED

Leaves leathery or sandpaper-hairy, mostly not toothed. Flower clusters white to pink; fruits fleshy but red-hairy in sumacs. Buds of sumacs and California Buckthorn lack scales. See also Hollyleaf Buckthorn (Pl. 27), some oaks (Pls. 33, 34), and trees of Pls. 44 and 46. Mostly southwestern.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length (in.)	Leafstalks under $\frac{3}{8}$ in. <sup>2</sup>	Leaf edges sometimes <sup>2</sup>	Buds hairy	Fruits <sup>3</sup>	Text page
<b>PACIFIC MADRONE</b> <i>Arbutus menziesii</i> <sup>8</sup> Leaves wide.	P	4-6	-	F	-	O	365
<b>ARIZONA MADRONE</b> <i>Arbutus arizonica</i> Leaves narrow ( $\frac{1}{3}$ length), V-based.	S	2-4	-	F	-	O	366
<b>TEXAS MADRONE</b> <i>Arbutus texana</i> <sup>8</sup> Leaves medium width, U-based.	T	2-4	-	F	-	O	366
<b>CATALINA CHERRY</b> <i>Prunus lyonii</i> Leaves pointed, pith slim.	P	2-4	-	W	-	B	366
<b>SUGAR SUMAC</b> <i>Rhus ovata</i> Leaves pointed, folding; pith wide.	PS	3-4	-	C	+	S	367
<b>LEMONADE SUMAC</b> <i>Rhus integrifolia</i> <sup>4</sup> Leaves blunt, not folding; s. Calif.	P	1-2½	+	PS	±	S	367
<b>(CALIFORNIA BUCKTHORN</b> <i>Rhamnus californica</i> ) <sup>5</sup> Leaf veins parallel.	PS	2-4	-	F	+	V	368
<b>ANACUA</b> <sup>6</sup> <i>Ehretia anacua</i> Leaves rough, rounded, tiny tips.	sT	2-2½	+	C	-	O	369
<b>ANACAHUITE</b> <sup>7</sup> <i>Cordia boissieri</i> Leaves rough, pointed, white-woolly.	sT	2-8	-	W	+	R	369
<b>SPARKLEBERRY</b> <i>Vaccinium arboreum</i> Leaves with tiny tips; to cen. Texas.	E	1-2	+	F	-	B	370

<sup>1</sup> E = e. U.S., P = Pacific states, S = Southwest, T = w. Texas, sT = s. Texas.

<sup>2</sup> C = coarse-toothed, F = fine-toothed, P = prickly, S = smooth, W = wavy.

<sup>3</sup> B = black, O = orange-red, R = red, S = sticky, V = variably black or red.

<sup>4</sup> Leaves rarely divided into 3 leaflets.

<sup>5</sup> Some leaves may be opposite.

<sup>6</sup> ah-NAH-kwah.

<sup>7</sup> ahnahcah-WEE-tah.

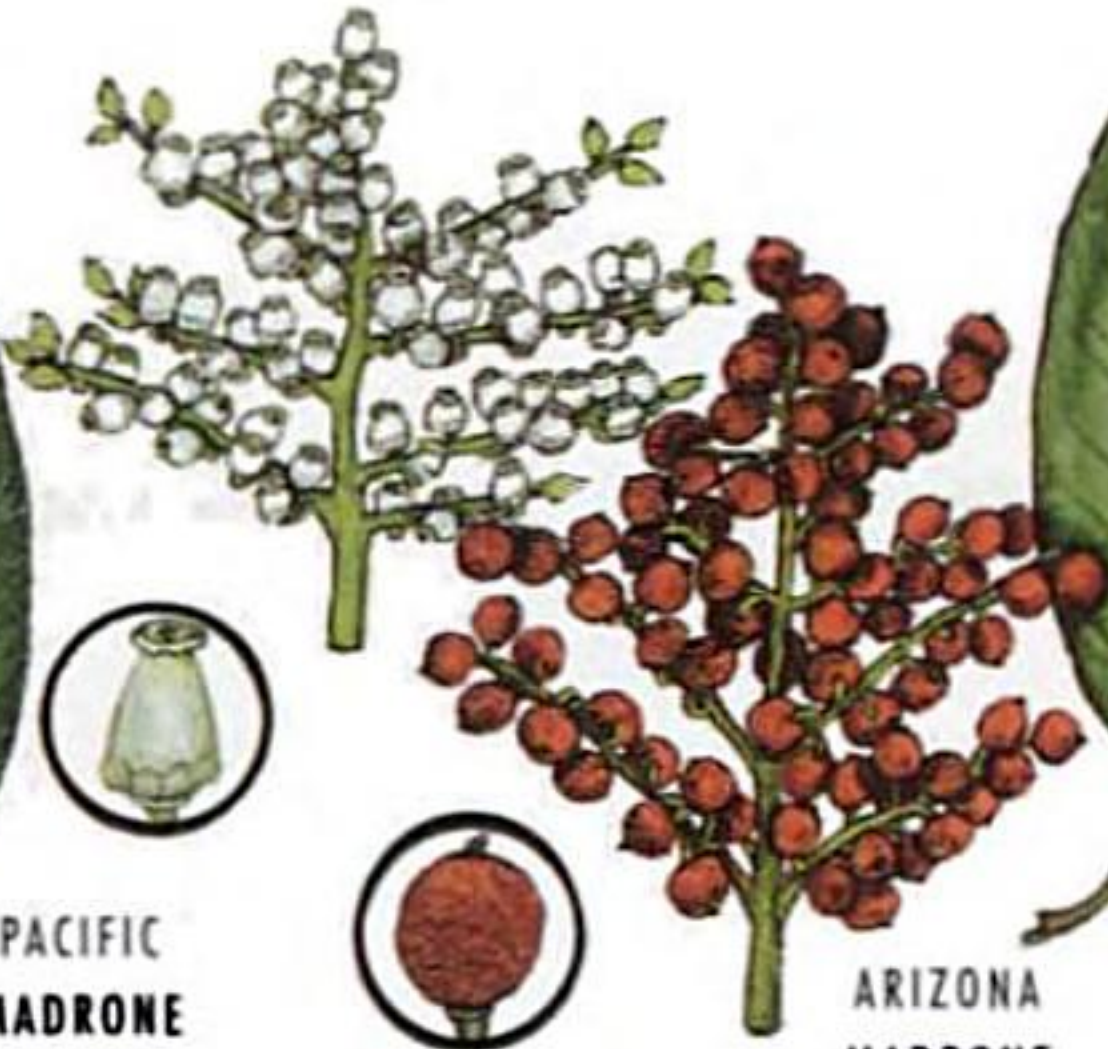
<sup>8</sup> Trunk smooth, red, peeling.







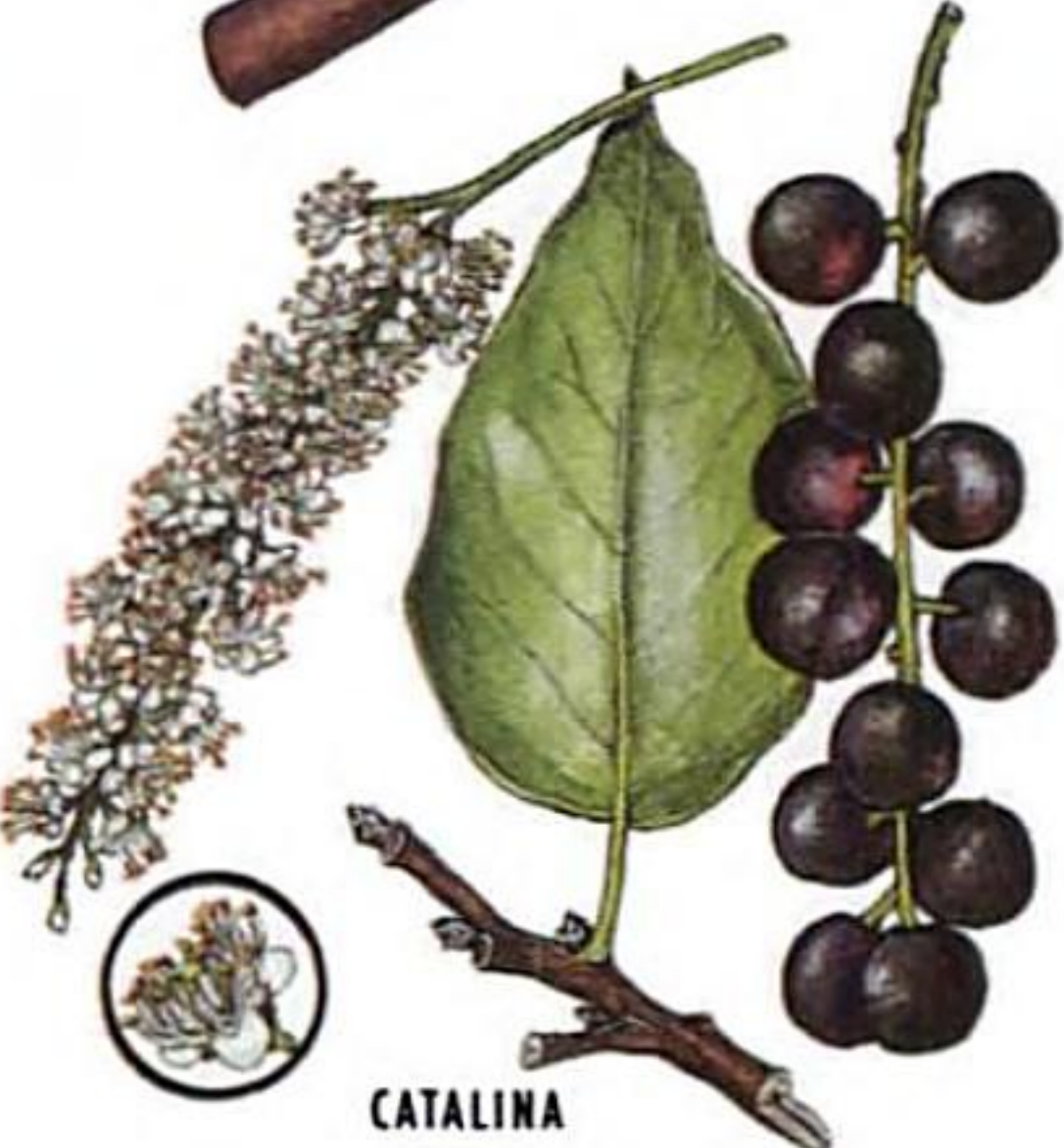
PACIFIC  
MADRONE



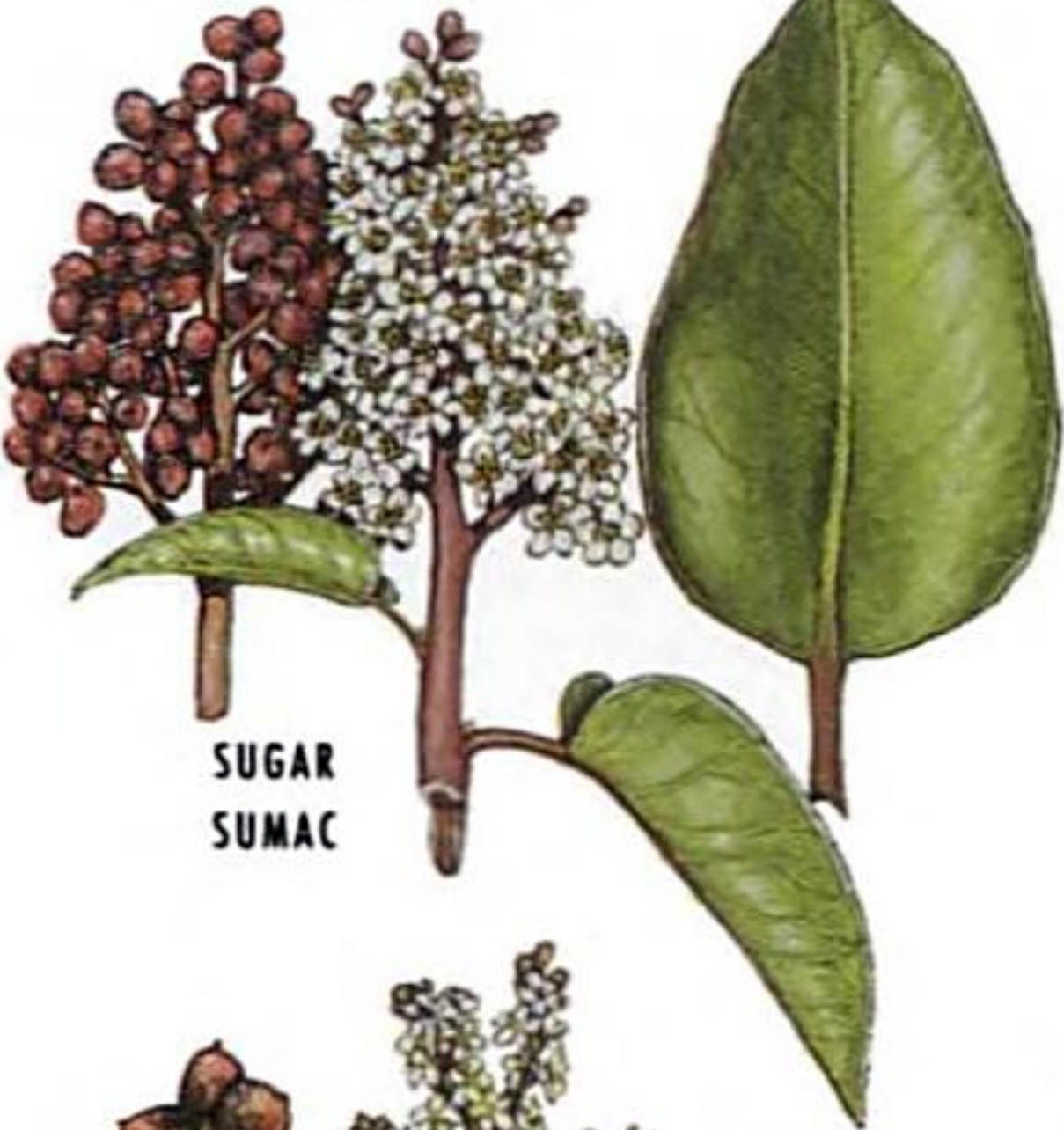
ARIZONA  
MADRONE



TEXAS  
MADRONE



CATALINA  
CHERRY



SUGAR  
SUMAC



LEMONADE  
SUMAC



ANACUA



ANACAHUITE



SPARKLEBERRY

V



## TREES WITH ALTERNATE EVERGREEN LEAVES NOT TOOTHED

Leaves mostly leathery. See also some oaks (Pls. 33–35), Bonpland Willow (Pl. 37), and the sometimes-toothed species of Pl. 45. If leaves narrow, see also Pl. 39. If fan-veined, see also Blueblossom Ceanothus and Camphortree (Pl. 30). Twigs mostly hairless.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf length (in.) <sup>2</sup>	Leaves narrow <sup>3</sup>	Leaf edges rolled under	Leaf bases V-shaped	Leaves long-pointed	Fruits <sup>4</sup>	Text page
<b>PACIFIC RHODODENDRON</b> <i>Rhododendron macrophyllum</i> Flowers showy; B.C. to n. Calif.	P	+	±	+	+	—	D	370
<b>BLUEGUM EUCALYPTUS</b> <i>Eucalyptus globulus</i> Leaves <sup>5</sup> hang, curved; bark peels.	PI	+	+	—	—	+	D	371
<b>MANZANITAS</b> <i>Arctostaphylos</i> species Trunk smooth, red-brown; shrubby.	PS	—	—	—	—	—	R	372
<b>CURLLEAF CERCOCARPUS</b> <i>Cercocarpus ledifolius</i> <sup>6</sup> Leaves clustered on spurs	w	0	+	+	+	—	F	373
<b>LAUREL SUMAC</b> <i>Rhus laurina</i> Leaves fold, fruits white; Calif.	P	±	±	—	—	±	S	374
<b>KEARNEY SUMAC</b> <i>Rhus kearneyi</i> <sup>6</sup> Leaves ± blunt, fruits red-hairy; Yuma.	A	—	—	+	—	—	H	374
<b>TEXAS PERSIMMON</b> <i>Diospyros texana</i> <sup>6</sup> Bark mottled; deciduous north.	T	—	+	+	+	—	J	374
<b>REDBAY</b> <i>Persea borbonia</i> Leaves spicy, ± hairy, twigs angled.	TE	±	±	+	+	±	J	375
<b>POTATO-TREE</b> <i>Solanum elaeagnifolium</i> Leaves woolly with tar odor.	T	±	+	—	±	+	S	375

<sup>1</sup> A = Arizona and south; E = e. U.S., I = introduced from Australia, P = Pacific states, S = Southwest, T = Texas, w = widespread in mts.

<sup>2</sup> 0 = ½–1 ½ in., — = 1–2 ½ in., ± = 2–8 in., + = 3–12 in.

<sup>3</sup> Length at least 3x width.

<sup>4</sup> D = dry capsule; F = feathery; H = hairy; J = juicy, fleshy; R = reddish; S = smooth, hairless.

<sup>5</sup> Juvenile leaves often shorter and opposite.

<sup>6</sup> Leafstalks under ¾ in. long.





PACIFIC RHODODENDRON



BLUEGUM  
EUCALYPTUS



PARRY MANZANITA



CURLLEAF  
CERCOCARPUS



LAUREL  
SUMAC



TEXAS PERSIMMON



REDBAY



POTATO-TREE

KEARNEY SUMAC

V



PALMS AND TREE-CACTI

Southwestern desert plants with evergreen parallel-veined leaves or succulent thorny trunks. Palm trunks may be covered with dead leaves under natural conditions.

SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaf type <sup>2</sup>	Flower color <sup>3</sup>	Color of mature fruits <sup>4</sup>	Text page
<b>CALIFORNIA WASHINGTONIA</b> <i>Washingtonia filifera</i> Trunk stout, not flared at base; Calif./Ariz.	PS	Fa	W	B	377
<b>(MEXICAN WASHINGTONIA</b> <i>Washingtonia robusta</i> ) Trunk thinner, flared at base; planted Calif.	P	Fa	W	B	378
<b>MEXICAN PALMETTO</b> <i>Sabal mexicana</i> Leafstalk enters blade to 4 in.; s. Tex./Mexico.	T	Fa	W	B	378
<b>(DWARF PALMETTO</b> <i>Sabal minor</i> ) Leafstalk enters blade to 2 in.; to cen. Texas.	E	Fa	W	B	378
<b>DATE PALM</b> <i>Phoenix dactylifera</i> <sup>5</sup> Leaves to 20 ft. long; planted.	PS	Fe	W	B	378
<b>SAGUARO</b> <sup>6</sup> <i>Cereus giganteus</i> Trunk tall, thick, thorny, often branched.	S	T	W	R	379
<b>ORGANPIPE CACTUS</b> <i>Cereus thurberi</i> No trunk but many branches from base.	S	T	L	R	380
<b>INDIAN-FIG PRICKLYPEAR</b> <i>Opuntia ficus-indica</i> Flat pads with or without bristles.	S	P	Y	R	380
<b>JUMPING CHOLLA</b> <sup>7</sup> <i>Opuntia fulgida</i> Branches segmented, rounded, thorns barbed.	S	T	P	G	381

<sup>1</sup> E = se. U.S., P = Pacific states (s. Calif.), S = Southwest, T = Texas.  
<sup>2</sup> Fa = fan-shaped; Fe = featherlike; P = pads flat, bristly; T = thorny structures not flat.  
<sup>3</sup> L = lavender, P = pink, W = white, Y = yellow.  
<sup>4</sup> B = blackish, G = green, R = red.  
<sup>5</sup> Leaflets close to trunk spinelike.  
<sup>6</sup> sah-WAHR-oh.  
<sup>7</sup> CHOY-yah.

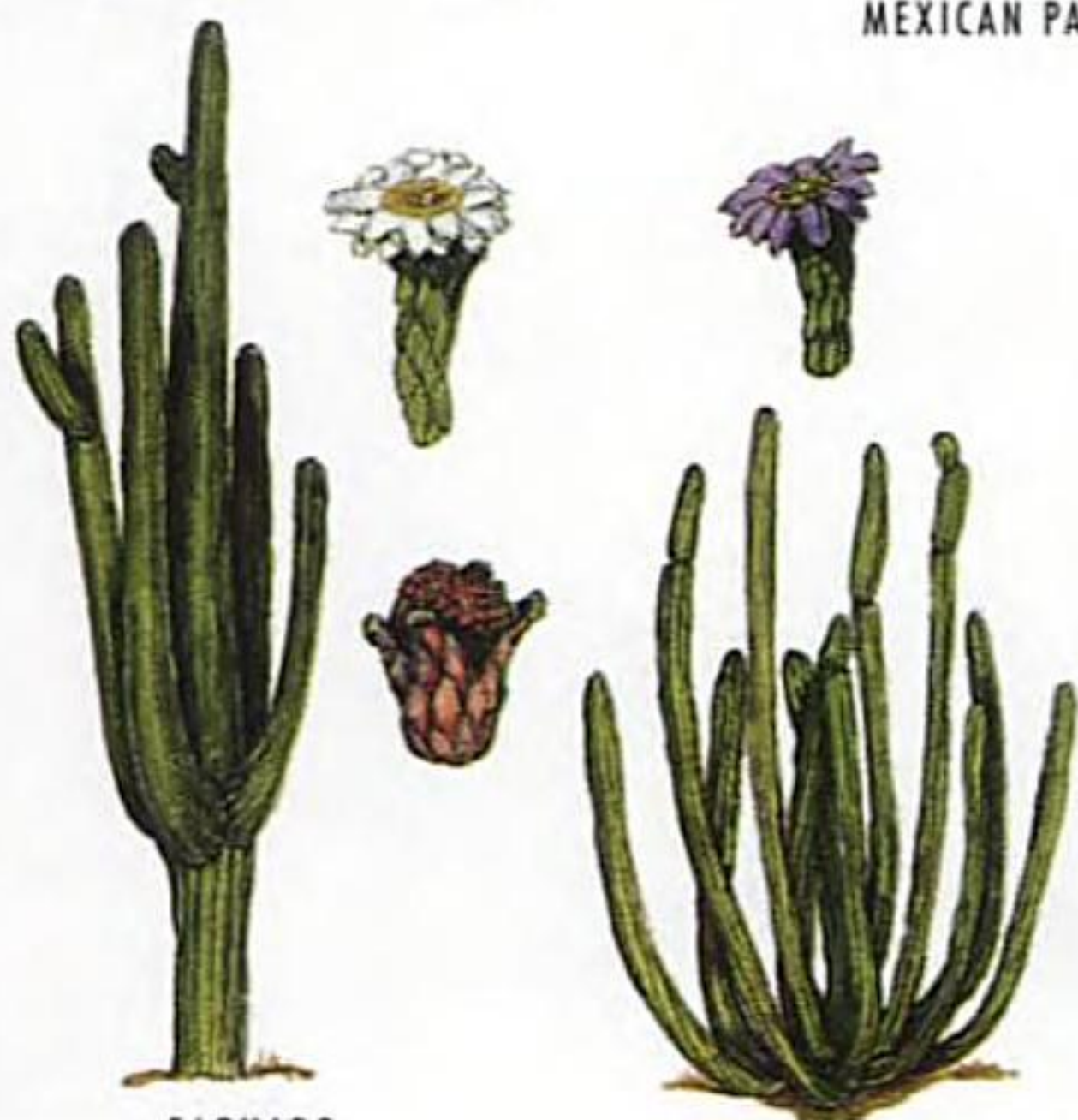






MEXICAN PALMETTO

DATE PALM



SAGUARO

ORGANPIPE CACTUS



INDIAN-FIG  
PRICKLYPEAR

JUMPING  
CHOLLA









# SPECIES ACCOUNTS





# TREES WITH NEEDLELIKE OR SCALELIKE LEAVES, MOSTLY EVERGREEN

PLATES 1-10

Cone-bearing trees are especially important in the West from both commercial and aesthetic standpoints. They and a few non-coniferous plants with tiny leaves make up this well-defined group. The leaves are either long and slender (needlelike) or small and overlapping (scalelike). Though individual needles and needle-clusters may drop throughout the year, most conifers are green the year around. The larches (Pl. 1) and baldcypress (Pl. 8), however, are exceptions. They drop their green foliage in autumn; their branches remain bare until spring. The deciduous tamarisks (Pl. 10) either lose their green scalelike leaves or retain them on protected branches in a dried brown condition.

Conifers are not the only evergreen trees; many broad-leaved trees (such as the madrones and live oaks) and tropical trees (like palms and yuccas) also hold green leaves throughout the year, but they are not part of this section.

The fruits of conifers typically are woody cones with seeds developed at the bases of the cone scales. The cones illustrated on the plates are the mature female cones. Male cones are small, pollen-producing organs that are obvious only during the early flowering period. Female cones usually take two years to mature. If cones are not present on the tree, old ones can frequently be found on the ground nearby.

The Pacific Yew, California *Torreya*, and junipers (Pls. 8, 10) have fleshy, somewhat berrylike fruits. While these bear little resemblance to the usual cones of members of the pine family, all are alike in being developed from naked ovules. Higher flowering plants have ovules enclosed in ovaries.

Foresters often refer to conifers as softwoods, in contrast to the broad-leaved trees, or hardwoods, though not all hardwoods are as hard as some softwoods.

Trees in this section can be identified by looking through Pls.



1-10 or by tracing the proper plate number using the following key:

1. Leaves  $\frac{3}{4}$ -1 8 in. long, needle-shaped. 2
1. Leaves  $\frac{1}{16}$ - $\frac{1}{2}$  in. long, mostly hugging the twigs, either blunt and scalelike or hollowed, awl-shaped. 10
2. Needles in groups along the twigs. 3
2. Needles 4-sided or flat, attached singly to the twigs. 8
3. Needles many, clumped on short spur branches.  
Larches, etc., Pl. 1
3. Needles bound at the base in bundles, spur branches absent. 4
4. Needles 1-3 per bundle. 5
4. Needles 5 per bundle. 7
5. Needles 1-2 per bundle. Pines, Pl. 1
5. Needles 3 per bundle. 6
6. Pines of California. Pines, Pl. 2
6. Ponderosa Pine plus pines of the Mexican border.  
Pines, Pl. 3
7. Needles  $2\frac{1}{2}$ -1 3 in. long. Pines, Pl. 4
7. Needles 1-2  $\frac{1}{2}$  in. long. Pines, Pl. 5
8. Dead twigs roughened by stiff woody pegs. Spruces, Pl. 6
8. Dead twigs smooth (hemlocks have weak pegs). 9
9. Needle scars smooth, circular; cones erect. Firs, Pl. 7
9. Needle scars various; cones pendent. Douglas-firs, etc., Pl. 8
10. Leaves scalelike, mostly blunt; cones woody.  
"Cedars," Cypressess, Pl. 9
10. Leaves both scalelike and awl-shaped; cones fleshy, solid.  
Junipers, etc. Pl. 10

## CONE-BEARING EVERGREEN TREES WITH CLUSTERED NEEDLES: LARCHES, 1 - AND 2 - NEEDLE PINES, AND AUSTRALIAN PINE (PLATE 1)

### LARCHES

Larches are trees mostly of cold latitudes and open mountain slopes with needles clustered on short spur branches and single on longer shoots. The larches are the only northern needle-bearing species that turn golden yellow and *drop their needles* in autumn, leaving obvious warty spurs on the branchlets. The slen-







*Tamarack (American Larch)*

der and flexible needles are triangular (4-sided in Subalpine Larch) as seen in cross section under a microscope. Larch cones are not prickly and have fewer and mostly thinner scales than pines. Larch seeds are long-winged and dispersed mainly by winds. Larches are often called tamaracks. Lumbermen in the Northwest reportedly sometimes misname Silver Fir (Pl. 7) as "larch."

## TAMARACK (AMERICAN LARCH)

*Larix laricina* (DuRoi) K. Koch

PL. 1

A medium-size tree with pointed top and slender yellow-green needles  $\frac{3}{4}$ –1 in. long. Twigs and branchlets *hairless, not* drooping. Cones  $\frac{1}{2}$ – $\frac{3}{4}$  in. long with no papery bracts protruding beyond the cone scales. Trunk bark dark, flaking in small scales. Height 40–80 (90) ft.; diameter 1–2 (3) ft., but in severe cold and wind-swept areas the species may only be a low shrub with branches flattened on the ground. Mostly wet organic soils. **SIMILAR SPECIES:** (1) European Larch has longer needles and cones, drooping branchlets, and bark divided into large plates. (2) Western and Subalpine larches also have longer needles and cones, and their cones have bracts protruding beyond the cone scales. (3) Baldcy-



press (Pl. 8) also loses its needles in winter, but it has flat needles and occurs in southern swamps. (4) Most tamarisks or salt-cedars (Pl. 10) are deciduous, too, but they have tiny juniperlike leaves, some of which usually remain in dried condition. **REMARKS:** Important for rough lumber (poles, posts, railroad ties). Tamarack seeds, needles, twigs, buds, and inner bark are eaten by ruffed, spruce, and sharptail grouse, red squirrels, snowshoe hares, whitetail deer, and porcupines. Grows nearly to the arctic tree line.

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**EUROPEAN LARCH** *Larix decidua* Mill.

**NOT SHOWN**

Widely planted in N. America and sometimes spreading. Needles 1–1½ in. long; twigs and branchlets *drooping*. Cones ¾–1½ in. with pointed bracts mostly not visible beyond the cone scales. Trunk bark divided into large plates. Height to 100 ft.; diameter to 2 ft. Mostly on upland sites.

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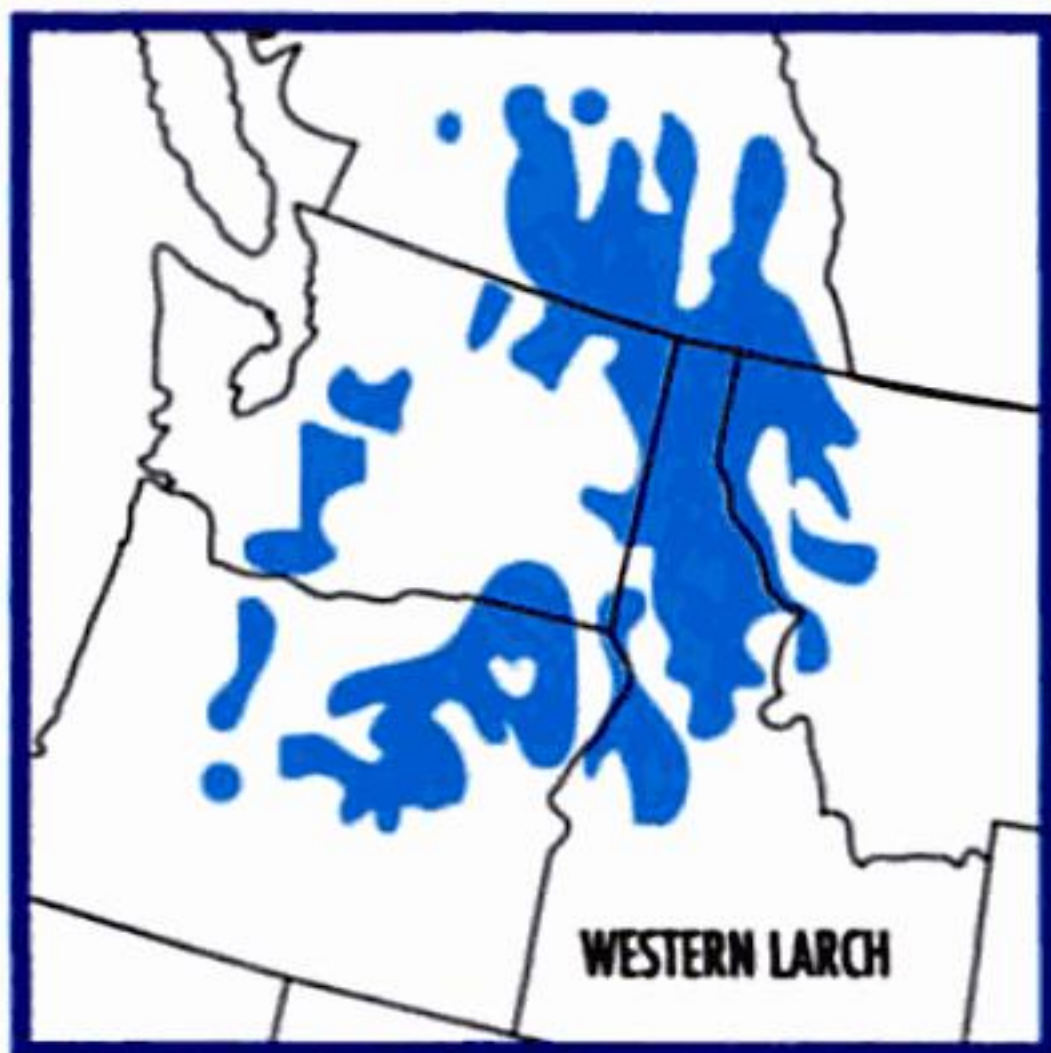
**WESTERN LARCH** *Larix occidentalis* Nutt.

**PL. 1**

The largest of our larches, with distribution centered in the Columbia R. basin. Tree slender, columnar with short branches and sparse foliage. Needles 1–1¾ in. and somewhat flattened or



*Western Larch*





triangular. Twigs  $\pm$  *hairless*. Cones 1–1½ in. long with *pointed* bracts projecting beyond the cone scales. Mature bark thick and broken into reddish brown ridges. Height 100–180 (240) ft.; diameter 3–4 (8) ft. Mountain slopes and bottomlands, 2000–8000 ft. elevation. **SIMILAR SPECIES:** Subalpine Larch is distributed in much the same region but grows mainly near timberline and in other exposed positions. It has a broad crown plus white-hairy twigs and toothed, protruding cone bracts. **REMARKS:** A fire-resistant species protected by bark several inches thick and sometimes living 900 years. Young trees grow rapidly. Useful for poles and house construction. Twigs are an occasional food of deer, while blue and spruce grouse eat the needles.

## SUBALPINE LARCH *Larix lyallii* Parl.

PL. 1

A tree of the Pacific Northwest mountains. Often a gnarled timberline plant, but less stunted specimens may occur at high sheltered locations and also as low as 5000 ft. elevation. Needles slender, 1–1½ in. long, and rounded or indistinctly 4-sided. Twigs *white-hairy*. Cones 1½–2 in. long, with *ragged* bract tips protruding between the scales. Height 30–50 (90) ft.; diameter 1–3 (6) ft. Poor soils. See Western Larch.

*Subalpine Larch*





TRUE CEDARS (*Cedrus* SPECIES., NOT SHOWN)

The imported Atlas (*C. atlantica* Manetti), Deodar (*C. deodara* Loud.), and Lebanese (*C. libani* Loud.) cedars resemble larches in the arrangements of needles and spurs but are *evergreen*. Introduced from N. Africa, the Himalayas, and the Middle East, respectively, they are planted in parks and gardens mainly in areas of moderate climate. Needles are ½–2 in. long and quadrangular in cross section. Blue varieties are common. Cones are 2–5 in. long, upright, wider than those of larches and with thin, wide scales. Whereas larch cones fall as a single unit, the scales of *Cedrus* cones fall separately after the second summer. Seeds are broad-winged.

TRUE CEDARS	Needle length (inches)	Leader droops	Branchlets droop	Twigs hairy	Cone length (inches)	Cone scale tips	Scale width (inches)
ATLAS	½–1	–	–	+	2–3	SQUARE	1½
DEODAR	1–2	+	+	+	3–5	ROUND	1¼–1½
LEBANESE	1–1¼	–	–	–	3–5	BLUNT	1¼–2½

PINES (PLATES 1–5)

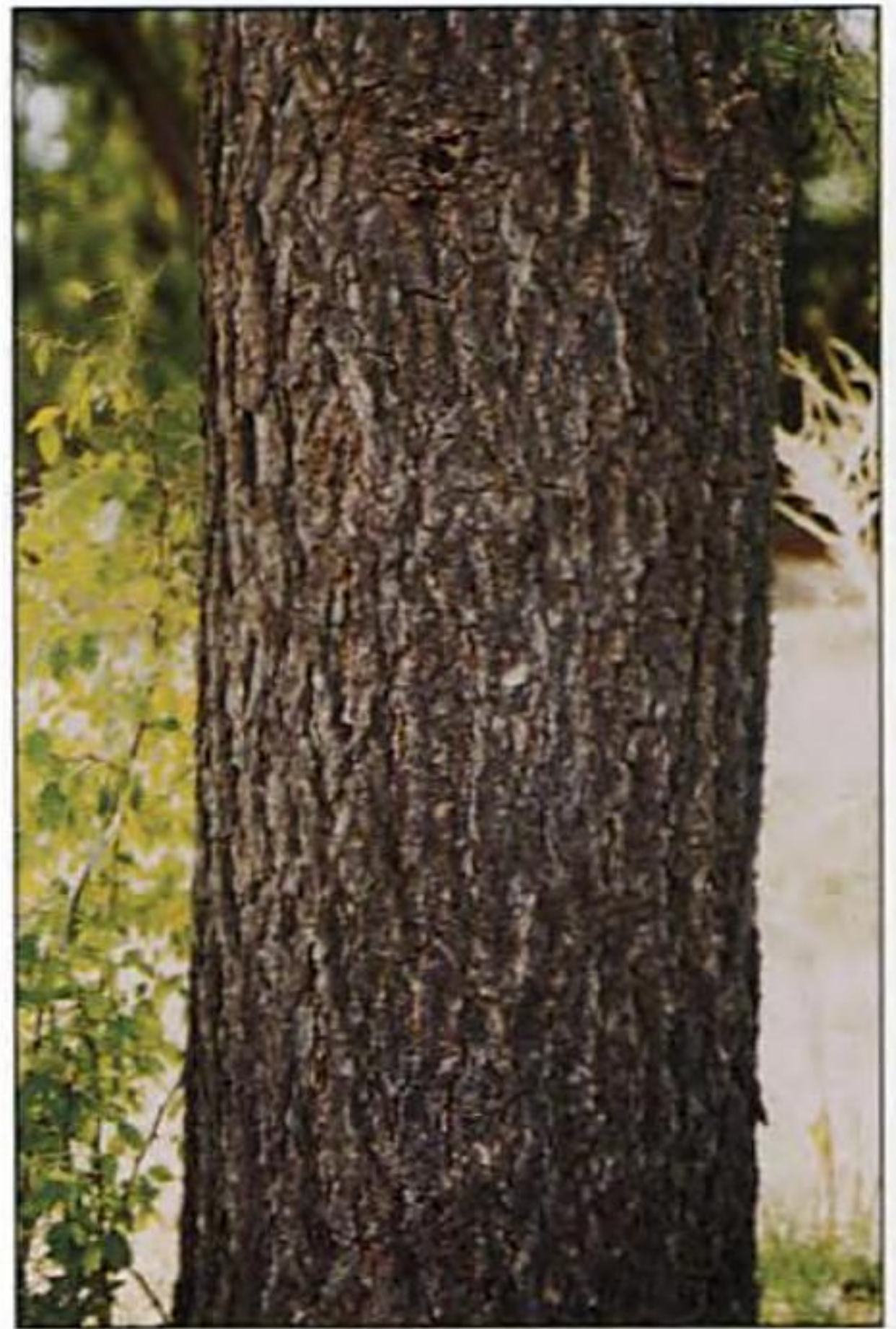
Pines are cone-bearing evergreen trees with slender needles mostly in clusters of 2 to 5. There are two principal groups, the white or soft pines and the yellow or hard pines. White pines have soft, clear wood and *thin, blue-green* needles in clusters of 5 (1–4 in some species), each needle with one vascular bundle. Such bundles are ducts running the length of the needle and are visible in cross section under the microscope. Members of the white pine group mostly have *lengthened* cones with *thin* scales that *lack* thorns. In contrast, yellow pines have harder and more resinous wood plus needles in clusters of 2–3 (5, in two forms). Each needle has two vascular bundles. The cones of yellow pines tend to be *short-stalked* and *egg-shaped* with *thick, thorny* scales.







*Bark of Singleleaf Pinyon*

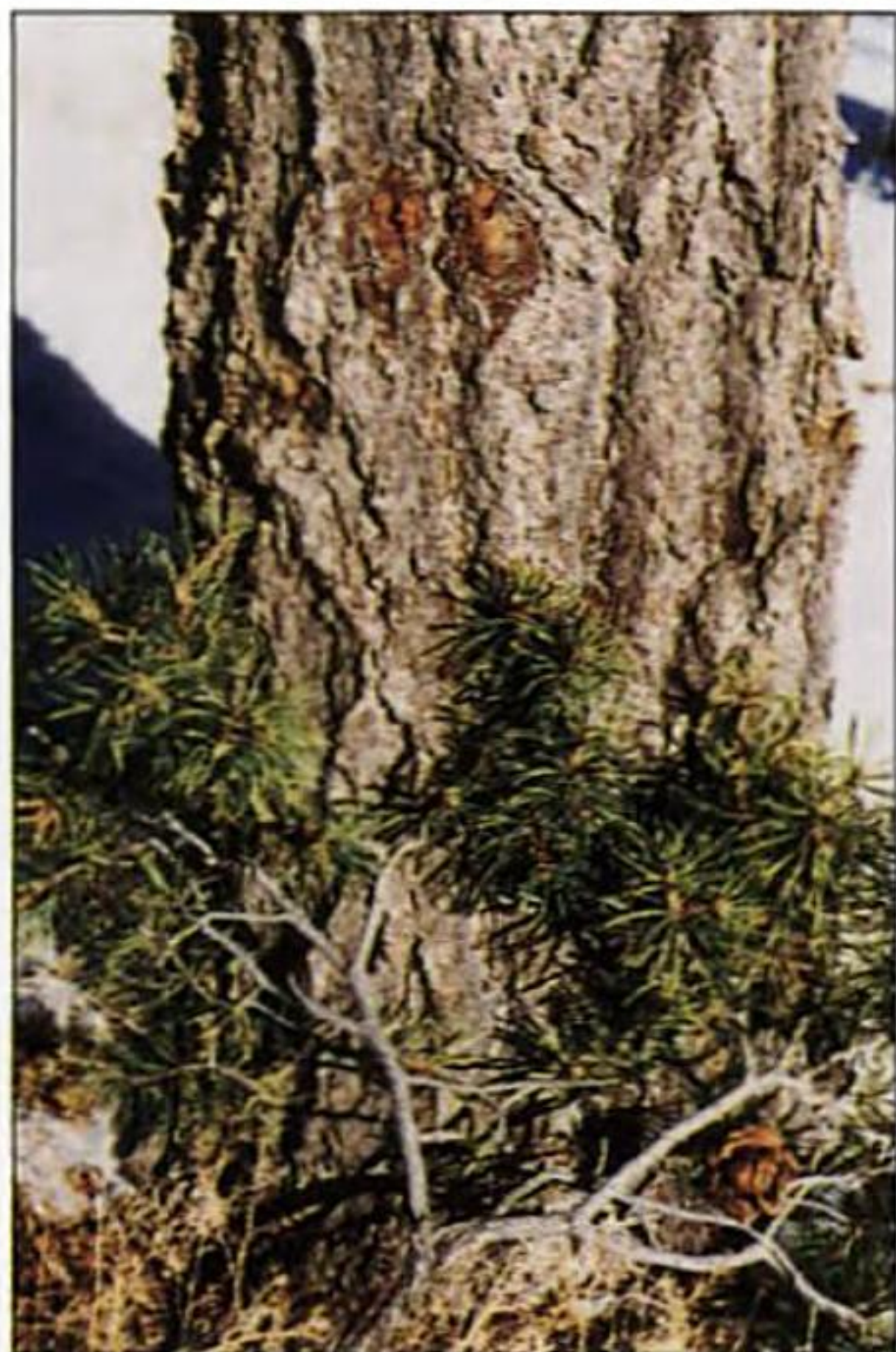


Both groups of pines have the needle clusters wrapped in thin, papery sheaths at the base. The sheaths tend to drop early in white pines. One species, Singleleaf Pine, does not have its needles in groups (except occasionally when there are two in a bundle). Its needles, nevertheless, have a deciduous sheath around the base and other characteristics that indicate white pine relationships. Leaf sheaths are short in all pines of Pl. 1 except for Lodgepole/Shore Pine and Bishop Pine.

The cones described are the mature woody female cones. These usually take two years to mature but in some species may remain unopened on the tree for several years. The seeds of most pines are winged; the relative length of seed to wing often assists in identification. Wing lengths are measurements beyond the seed itself. Seeds are located between the cone scales. They will usually drop from dried-out mature cones. Pine branches occur in whorls around the trunk; normally one whorl is added at the tree top each year.

Pines are probably the world's most important timber trees. Mostly germinating best and growing well on bare and infertile mineral soils, they yield not only lumber but also turpentine, pitch, and various oils. Pine seeds are eaten by many birds and small mammals, while twigs and needles serve as food for deer,





*Two-needle Pinyon*

moose, and other browsing animals. Hybrids between species do occur and result in some specimens being difficult to identify. The two-needle Aleppo Pine (*P. halepensis* Miller) of s. Europe is planted as a landscape tree in some areas. It has very thin needles, ash-gray branchlets, and thornless cones.

**SINGLELEAF PINYON** *Pinus monophylla* Torr. & Frem. **PL. 1**  
One of the easiest pines to recognize. The *single* (rarely 2 or 3), stout, *spine-tipped* and grayish needles, 1–2¼ in. long, are field marks. Cones 2–3 in. long and nearly globular, with thick, blunt, *thornless* scales and two nearly inch-long wingless nuts per scale. Height to 40 ft. Arid soils. **SIMILAR SPECIES:** No other pine has either single or spine-tipped needles (but see Remarks under Two-needle Pinyon). **REMARKS:** Also called Singleleaf Pine. The nuts are eaten by many birds, rodents, deer, and other wildlife. They were an important food of the early Native Americans and are still much sought after by local residents. Pine nuts are especially tasty when roasted. Two-needle Pinyon, Mexican Pinyon (Pl. 5), and Parry Pinyon (Pl. 5) are related nut pines which, though also not 5-leaved, are all considered to have had origins as members of the white pine group.



**TWO-NEEDLE PINYON** *Pinus edulis* Engelm. **PL. 1**

A short, round-topped, arid-zone tree mainly of the s. Rockies. Needles 2 per cluster,  $\frac{3}{4}$ –2 in. long, dark green, sharp but *not* spiny. Cones *short*, 1–2 in. long, somewhat spherical, with thick, blunt, *thornless* scales and 2 wingless half-inch nuts per scale. Height 15–20 (50) ft.; diameter 1–2 (3) ft. Dry sites. **SIMILAR SPECIES:** See Lodgepole Pine. **REMARKS:** Like the other nut pines (see Singleleaf Pinyon), the fruits are eagerly sought by wildlife and humans alike. Reported to be the most common tree in N.M. A single-needle population is reported to occur in cen. Ariz. Resin from trunk wounds is said to have been used by Native Americans to waterproof woven bottles and to cement turquoise jewelry.

**LODGEPOLE/ShORE PINE**

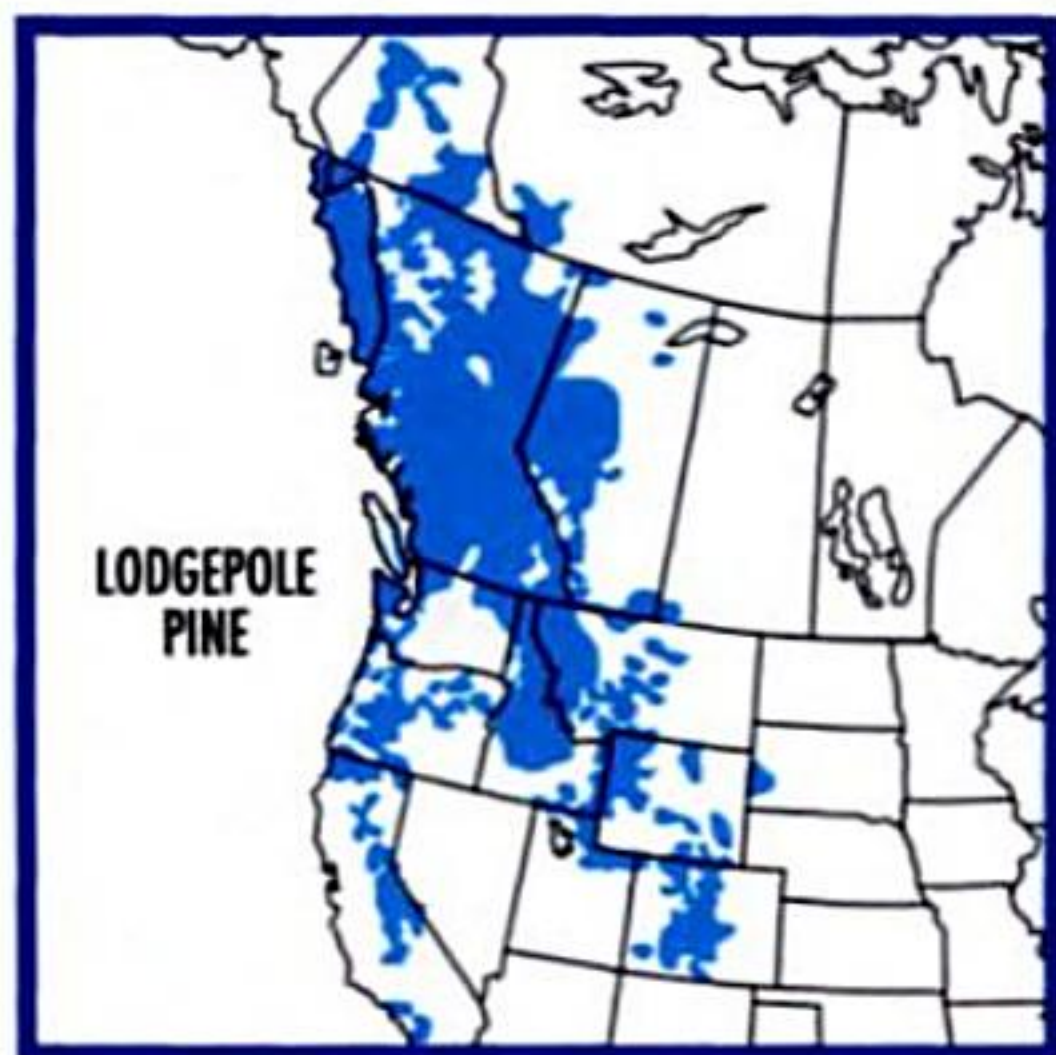
*Pinus contorta* Dougl. ex Loud. **PL. 1**

Though sufficient differences exist between the Rocky Mountain and Cascades-Sierra Nevada forms for each to be named as a separate variety, both are tall, narrow trees with somewhat sparse yellow-green needles and thin, scaly, *yellowish*, *cornflakelike* bark. Needle sheaths are  $\frac{1}{16}$ – $\frac{1}{8}$  ( $\frac{3}{16}$ ) in. long. Both are known as Lodgepole Pine. On the Pacific slope, however, from the Alaska panhandle through nw. Calif., a third variety is a short, round-topped tree with dense dark green needles and a *blackish furrowed* trunk. It is known as Shore Pine. In contrast to the Lodgepole Pines, which seems to hold their needles for 1–2 (4) years, Shore Pine often has the previous 3–4 (7+) years' growth sheathed with needles along the branches. The several forms within the species all have 1–2 (3) in. needles with 2 per cluster. Cones 1–2 in. long,

*Bark of Lodgepole  
Pine*







usually off-center at the base, with *thin* scales tipped with *slender prickles*, usually persisting on the tree. Seed  $\frac{1}{8}$  in.; wing  $\frac{1}{2}$  in. Coastal trees 15–30 ft. tall and 1–2 ft. in diameter; inland specimens 60–100 (115) ft. and 1–2 (3) ft. diameter. Damp to dry sites. **SIMILAR SPECIES:** (1) Two-needle Pinyon, also with short needles and cones, has no cone prickles. (2) Bishop Pine is found only within a few miles of the ocean and has 4–6 in. needles and large, thick-scaled, heavy cones. In the Pacific Northwest and w. Canada, see (3) Austrian and (4) Jack pines. **REMARKS:** Typical Lodgepole Pine is a “fire species.” Following blazes that are not so severe as to destroy all cones, massive seed releases result in dense stands of young trees, which become gradually thinned by competition. The slender trunks of these saplings once were used by Native Americans to support their buffalo-hide tepees. Nowadays, clear trunks about 8–10 in. in diameter are peeled, planed, and fitted to make attractive log homes. Wood also is harvested for paper pulp. Seeds are eaten by squirrels, chipmunks, and grouse while twigs are browsed by deer and elk. Porcupines gnaw the inner bark, damaging many trees in some areas.

#### AUSTRIAN PINE *Pinus nigra* Arnott

**NOT SHOWN**

A tree mainly of cen. and s. Europe but widely planted and spreading in the Pacific Northwest. Needles dark green, rather stiff, 3–6 in. long, with  $\frac{1}{4}$ – $\frac{1}{2}$  ( $\frac{3}{4}$ ) in. basal sheaths. Winter end buds *whitish*. Cones 2–3 in. long, not persistent; scale prickles  $\frac{1}{16}$  in. long. Seed  $\frac{1}{4}$ – $\frac{3}{8}$  in.; wing  $\frac{1}{2}$ – $\frac{3}{4}$  in. Mature trunk with *grayish yellow* vertical bark plates. Resistant to pollution and sea air; useful in landscaping and for windbreaks. Known also, mainly in Britain, as Black Pine. **SIMILAR SPECIES:** Lodgepole Pine has shorter needles, needle sheaths, and cones as well as a scaly yellow trunk.



**JACK PINE** *Pinus banksiana* Lamb.**NOT SHOWN**

A shrubby, small or medium-sized tree distributed across Canada east of the Rockies and also in the ne. U.S. Needles yellow-green, *very short*, only 1–1½ in. long, with sheaths only ⅙–⅛ (⅓) in. long. Cones usually curved or *bulging* on one side, 1½–2½ in. long; persistent; scales either thornless or with tiny weak prickles. Seed ⅓ in.; wing ⅜ in. Height 15–40 (90) ft.; diameter 9–15 (24) in. with the smaller specimens widespread east of our area. Mostly poor soils. **SIMILAR SPECIES:** No other northern pine has such short needles or curved cones. Lodgepole Pine needles are somewhat longer and, though off-center at the base, the cones do not bulge unevenly. **REMARKS:** Produces poor timber. Widespread in some northern areas of dry, infertile soils that would otherwise support no tree growth. Fires cause cones to open and release seeds. Reported to intergrade with Lodgepole Pine where their ranges meet in cen. Alta. and extreme sw. N.W. Terr.

**BISHOP PINE** *Pinus muricata* D. Don**PL. 1**

Native only within a few miles of the Pacific in scattered groves along the Calif. coastline, these are round-topped trees with dark *paired* needles 4–6 in. long. Bark brown. Cones 2–3½ in. long and nearly as wide; *asymmetrical* at the base. The scales are massively thick, with each more or less diamond-shaped tip supporting a thorn at the center. The cones become firmly attached to the branches for some years, even becoming embedded as the branches grow. Seeds ¼ in.; wing 1¼ in. Height 40–60 ft.; diameter 2–3 ft. Sea level to 1000 ft. elevation. Fog belt from Santa Cruz, Calif., northward almost to Oregon, also Santa Cruz and Santa Rosa islands. **SIMILAR SPECIES:** (1) Ponderosa Pine usually has most or all of its needles in threes. Two-needle Ponderosa specimens have larger and more symmetrical cones. Normally they would not occur within the range of Bishop Pine. See also (2) Lodgepole Pine. **REMARKS:** The species is thought to be so-named because it was discovered by a Catholic bishop in the 19th century. According to the fossil record, the species was more widespread in earlier geologic times.

**AUSTRALIAN-PINE (HORSETAIL CASUARINA)***Casuarina equisetifolia* L.**PL. 1**

Not a pine but resembling one. *Drooping* “needles” up to 1 ft. long attached *singly*. Each *evergreen* “needle” comprises a series of jointed, fine-grooved green sections that technically are twigs. The true leaves form whorls of 6–8 tiny gray scales fringing each joint between the sections. Fruits 1 in. long, brown, conelike but nearly ball-shaped. Height 60–90 (100) ft.; diameter 10–15 (18)



in. Subtropical locations. **SIMILAR SPECIES:** No native tree has jointed "needles." **REMARKS:** The casuarinas (also called beefwoods) comprise a large group of tropical species. Unlike pines, they are true flowering plants, though the blossoms are minute. The needles resemble those of the herbaceous horsetails (*Equisetum*). Imported from Australia and planted in parks and gardens; also used in windbreaks and hedges.

## THREE-NEEDLE PINES OF CALIFORNIA AND ITS BORDERS (PLATE 2)

Six of the ten 3-needle western pines occur mainly in Calif., with three of the six extending somewhat into sw. Ore. and/or w. Nev. All are members of the yellow or hard pine group, and all have evident papery *sheaths* ( $\frac{1}{8}$ – $\frac{1}{2}$  in. long) encasing the needle bases. Cones are mostly *stout*, *thorny*, and *short-stalked*. Probably the most abundant 3-needle species in Calif. is Ponderosa Pine (Pl. 3), which is common in mountains throughout the West. It is compared under Washoe and Jeffrey pines of this plate.

### KNOBCONE PINE *Pinus attenuata* Lemm.

PL. 2

A tree whose unusual *1-sided*, *curved* cones have some scale ends prominently raised as pointed *knobs*. Needles 3–6 in., slender and yellow-green. Cones *yellow-brown*, 3–7 in. long, *narrowly pointed*, mostly paired or whorled, hugging the branches. They usually remain closed on the tree, often partly buried in the expanding branches or trunk. Scales on the outer side *very thick*; scale knobs may or may not end in stout curved prickles. Seed  $\frac{1}{4}$  in.; wing  $\frac{1}{4}$  in. The trunk may be *forked*. Height 20–30 (80) ft.; diameter 6–12 (24) in. Dry slopes, scattered locally in Calif.'s coastal mountains and the Sierra Nevada to Baja California Norte, with





## Monterey Pine



the principal range of the species at 2000–5000 ft. elevation in the coastal mountains of nw. Calif. and sw. Ore. **SIMILAR SPECIES:** (1) Gray Pine, also with a forked trunk, has longer gray-green needles plus large, heavy, uniformly thorny cones.

(2) Monterey Pine occurs naturally only south of San Francisco. Its trunk is single and cones are brown, egg-shaped, and with scales moderately or not at all knobby. **REMARKS:** Wood weak and brittle. Not a useful timber tree.

### MONTEREY PINE *Pinus radiata* D. Don

PL. 2

With 3-needle clusters of dark needles 4–6 in. long, this species occurs locally at only a few places on the Calif. coast and on offshore Guadalupe Island, Mexico. Cones *deep brown*, 3–6 in. long, egg-shaped, *off-center* at the base. Scale tips diamond-shaped and *very thick*, some of them raised and knobby. Small straight prickles may or may not be present. Cones, often clustered, may remain closed and attached to the tree for years. Seeds  $\frac{1}{4}$  in.; wing 1 in. long. Trunk normally *single* and bark dark. Height 40–60 (100) ft.; diameter 1–2 (3) ft. **SIMILAR SPECIES:** See Knobcone Pine. Other 3-needle pines have broad cone scales with stronger thorns. **REMARKS:** Not an economically important tree in its home area but widely planted in portions of Africa, South America, and the South Pacific. In the southern hemisphere, where pines are not native, Monterey Pine grows tall and straight and has excellent timber value.

### WASHOE PINE *Pinus washoensis* H. Mason & Stockwell

PL. 2

Found to date only in the mountains of ne. Calif. and w. Nev., this 3-needle pine was not discovered until the late 1930s. It is most like Ponderosa Pine (Pl. 3), but needles are 4–6 in. long, thick, and *gray-green*. Cones only 2–3½ (5) in. long, with slender *straight-down* prickles and 160–190 total scales. Seed  $\frac{1}{8}$  in.; wing  $\frac{1}{2}$  in. Height 40–50 (60) ft.; diameter 1–2 (3) ft. Mature bark in yellowish plates. Established above the Ponderosa Pine belt,





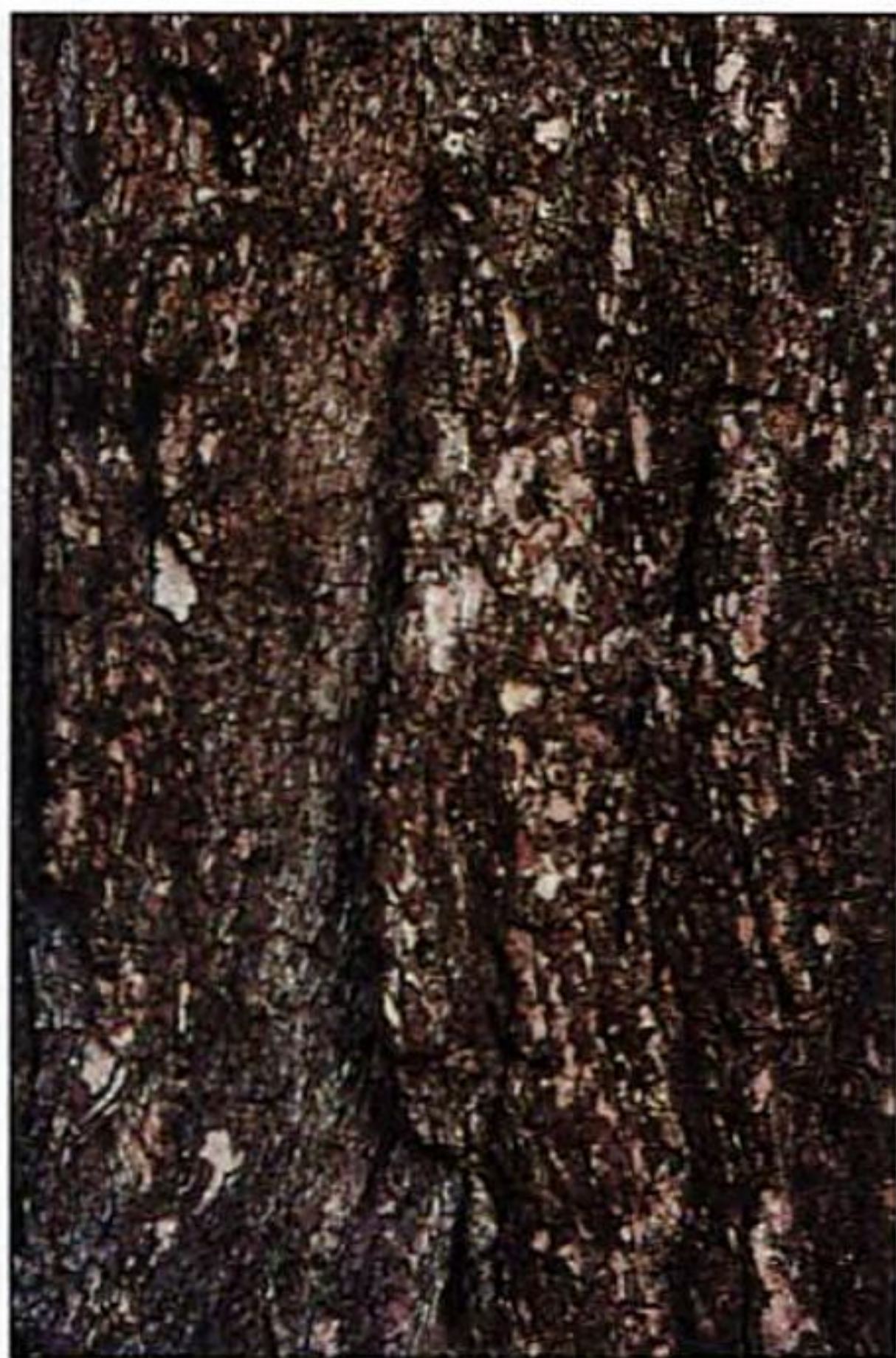
mainly at 8000 ft. and higher. Identified only on the western border of the Great Basin near Galena Creek, Mt. Rose, Washoe Co., Nev. and in the Bald (Babbitt Peak) and Warner mts., Calif. Also Blue Mts., Ore. **SIMILAR SPECIES:** (1) Ponderosa Pine (Pl. 3) has 4-10-in. yellow-green needles and 3-6-(8-)in. cones. Its cones have straight or curved-out prickles, 130-140 total scales, and seed wings more than

twice as long as the seeds. (2) Jeffrey Pine has 5-10-in. needles, 6-10-in. cones with curved-in lower prickles, seed wings 3 times seed length, and mature trunk bark rosy, tight.

## JEFFREY PINE *Pinus jeffreyi* Grev. & Balf.

**PL. 2**

Much like Ponderosa Pine (Pl. 3) and at one time confused (or combined as a variety) with it. A large 3-leaved pine with blue-green needles 5-10 in. long and basal sheaths mostly  $\frac{1}{4}$ - $\frac{1}{2}$  in.



*Bark of Jeffrey Pine*



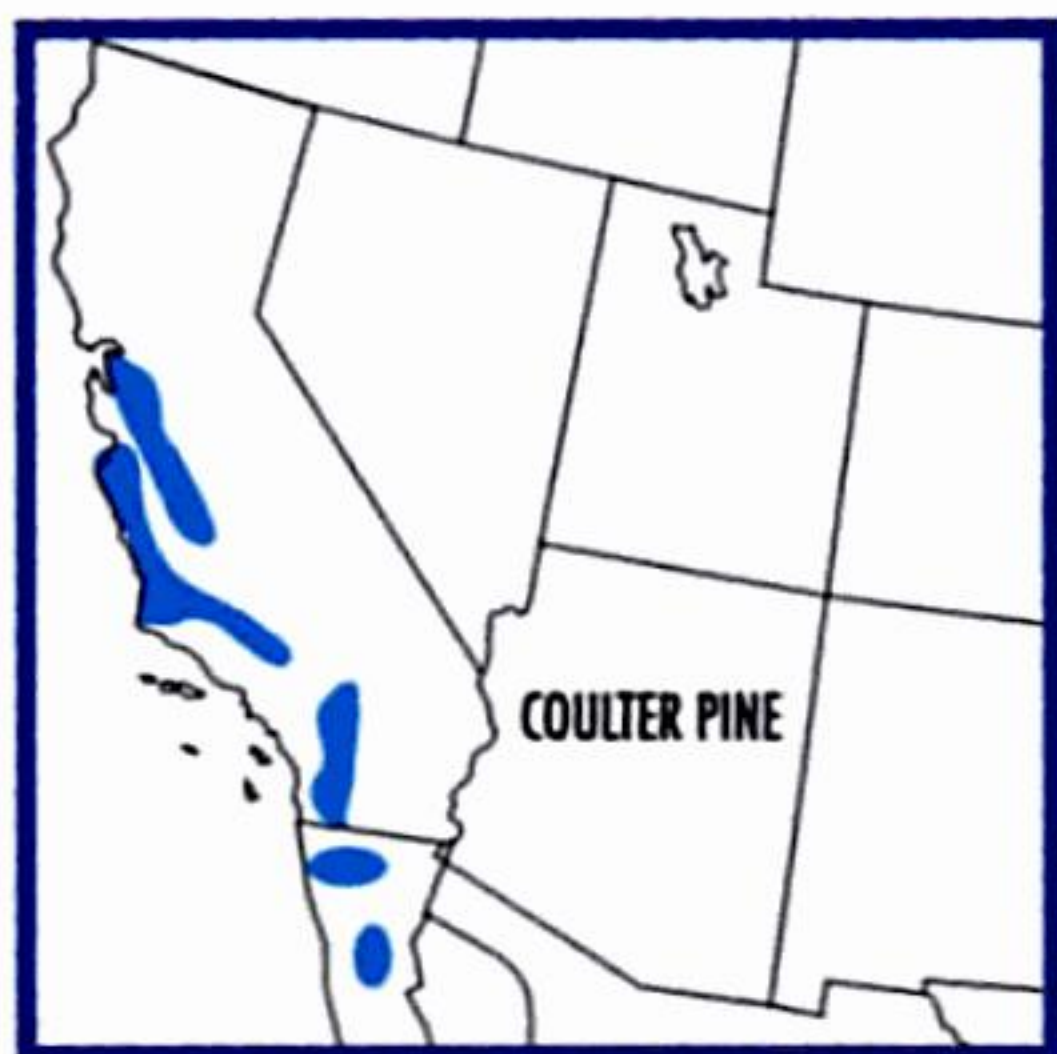


long. Cones 6–8 (10) in. long, shiny, with symmetrical bases. Cone scales stiff, flat, light brown beneath, and tipped by moderate-size prickles, at least the lower ones usually *curved in*. Seed  $\frac{1}{2}$  in.; wing  $1\frac{1}{2}$  in. Trunk bark *firm* and furrowed, somewhat *purplish* or rosy in hue and yielding a vanilla or pineapple-like odor when one's nose is pressed into a deep furrow. This pleasant scent also may be given off by broken twigs. Height 100–130 (180) ft.; diameter 2–4 (6) ft. Mountain slopes, mostly between 6000–9000 ft. elevations. **SIMILAR SPECIES:** In contrast to (1) Ponderosa Pine (Pl. 3), Jeffrey Pine has bark with tight texture and fruity odor as well as cones that are larger, rigid, and shiny. It mostly occurs at elevations somewhat higher and drier than those occupied by Ponderosa Pine. See also (2) Washoe Pine. **REMARKS:** An important timber tree often marketed with Ponderosa Pine as Yellow Pine. The seeds are eaten by squirrels, chipmunks, grouse, and quail. Named after an early Scottish botanical explorer, John Jeffrey. Known to hybridize with Ponderosa and Coulter Pines.

## COULTER PINE *Pinus coulteri* D. Don

PL. 2

A 3-needle tree with the heaviest and most thorny cones of all western pines. Needles blue-green, 6–12 in. long, stout and tufted near the ends of the branches. Twigs  $\frac{1}{2}$ –1 in. thick. Cones massive, 10–14 in. long and often weighing 4–5 lbs. They are long-stalked and *yellowish*, with thick scales ending in curved *outward-pointing*, spiky *claws* up to  $1\frac{1}{2}$  in. long. Cones obvious, remaining on the tree for years. Seed  $\frac{1}{2}$  in.; wing 1 in. Trunk *single*; bark dark, furrowed. Height 40–60 (80) ft.; diameter 1–2 ( $2\frac{1}{2}$ ) ft. Dry slopes. **SIMILAR SPECIES:** Gray Pine also has large and heavy cones. Its forked trunk, slender twigs, somewhat smaller and less thorny brownish cones, and markedly gray-green drooping foliage distinguish it where the two species overlap in range.







Gray Pine

**REMARKS:** The seeds once were eaten by Native Americans. Thomas Coulter, an early 19th-century medical doctor, discovered the species. Hybrids with Jeffrey Pine have been recorded.

**GRAY PINE** *Pinus sabiniana* Dougl. ex D. Don

**PL. 2**

Needles 3 per cluster, distinctly *gray-green*, 7–14 in. long, *drooping*, and with  $\frac{1}{4}$ – $\frac{1}{2}$  in. sheaths. Twigs  $\frac{1}{8}$ – $\frac{1}{2}$  in. in diameter. Cones 6–10 in. long and weighing one or more pounds. They are *brown*, long-stalked, uneven-based, and equipped with strong, *downward-pointing*,  $\frac{1}{2}$ – $\frac{3}{4}$ -in. thorns. Cones usually remain attached to the tree for some years. Seed  $\frac{3}{4}$  in.; wing  $\frac{3}{8}$  in. Trunk usually *forked*, grayish, furrowed. Height 40–50 (90) ft.; diameter 2–3 (4) ft. Occurs at low elevations (1000–3000 ft.) from n. Calif. to n. Los Angeles Co. **SIMILAR SPECIES:** See (1) Knobcone and (2) Coulter pines. **REMARKS:** The seeds were once an important food of Native Americans, though they are more resinous than those of the pin-yon (nut) pines. It is reported that the buds and soft green cones of this pine also were eaten. The seeds are consumed, too, by squirrels and other rodents. Named after Joseph Sabine, a London lawyer and naturalist who supported botanical studies in the early 19th century. Also called Digger Pine.

## PONDEROSA PINE PLUS 3-NEEDLE PINES OF THE MEXICAN BORDER (PLATE 3)

Ponderosa Pine is the most widely distributed and important pine in the West. In addition to it and the several 3-needle pines of the California region (Pl. 2), three others occur along the border with Mexico. These can be seen at Chiricahua Nat'l. Monument in se.





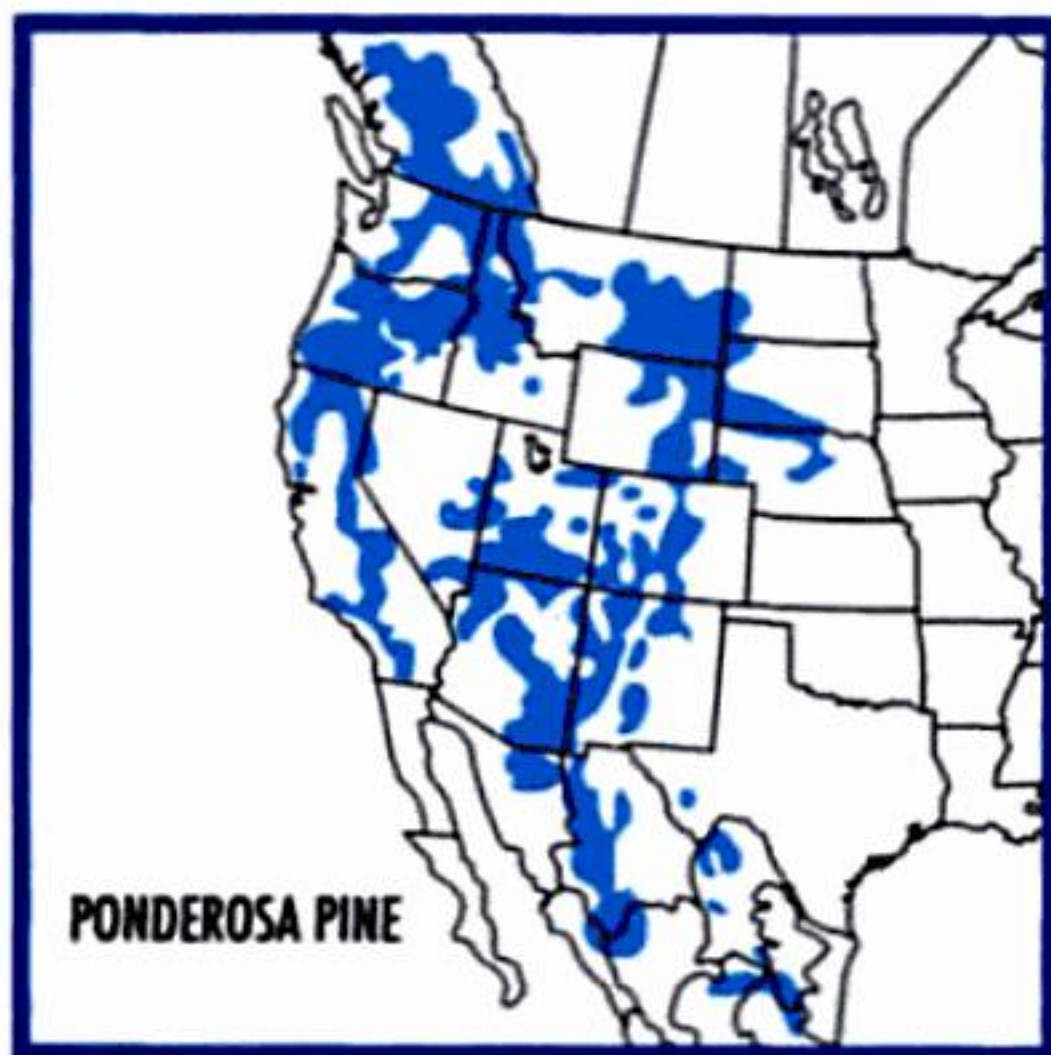


Ariz. and on Mt. Lemmon, just ne. of Tucson, Ariz. Mexican Pin-yon and Chihuahuah Pine have deciduous needle sheaths. A 3-needle pine of the se. United States, Loblolly Pine (*P. taeda* L.) with 6–9 in. needles and dark trunk bark, ranges west to near Austin, Texas.

**PONDEROSA PINE** *Pinus ponderosa* Dougl. ex Laws. **PL. 3**

The most common and widespread western conifer, the distribution of Ponderosa Pine is sometimes said to outline the American West. It occurs mostly in mountains from s. B.C., sw. N.D. and cen. Neb. to s. Calif., w. Texas, and n. Mexico. Typically, Ponderosa Pine is a 3-needle species, sometimes with a few 2-needle clusters present. Needles 4–10 in., yellow-green, with basal sheaths  $\frac{1}{4}$ –1 in. long. Twigs  $\frac{1}{4}$ – $\frac{1}{2}$  in. thick. Cones egg-shaped, 3–6 in. long, *dull brown*, short-stalked, and with bases symmetrical. Scales rather flexible, dark brown beneath, and tipped with a slender,  $\frac{1}{8}$ – $\frac{3}{16}$  in. prickle often *curved out*; total scales 130–140. Seed  $\frac{3}{8}$  in.; wing 1 in. Mature specimens have trunks with bark in flaky *yellow* plates from which jigsawlike pieces can easily be removed. Younger trunks are dark, furrowed. Trunk bark and broken twigs have a *resinous* odor. Height 60–130 (230) ft.; diameter 2–4 (8) ft. Mostly 3000–5000 (9500) ft. elevation. Specimens in the Rocky Mts. region have darker bark, needles mostly 3–6 in. long and more often in twos, plus cones smaller. **SIMILAR SPECIES:** See (1) Jeffrey and (2) Washoe pines (Pl. 2), and (3) Apache Pine (below). For Arizona Pine, a 5-needle variety, see p. 141 and Pl. 4. **REMARKS:** The most economically important pine in the West. Over large regions, it is the only 3-needle pine, the only pine with long needles, and the only tree of significant commercial value. It





forms pure or nearly pure stands in many areas, mostly on dry soils and at lower elevations than many pines. Like most pines, it is a sun-loving species. It grows rapidly and shows considerable ability to survive surface fires. Sooty grouse, California quail, and both red and gray squirrels eat the seeds; porcupines feed on the inner bark; deer browse the twigs and needles. Native Americans are reported to have used the seeds for food and the trunk resin to waterproof fiber and wicker containers.

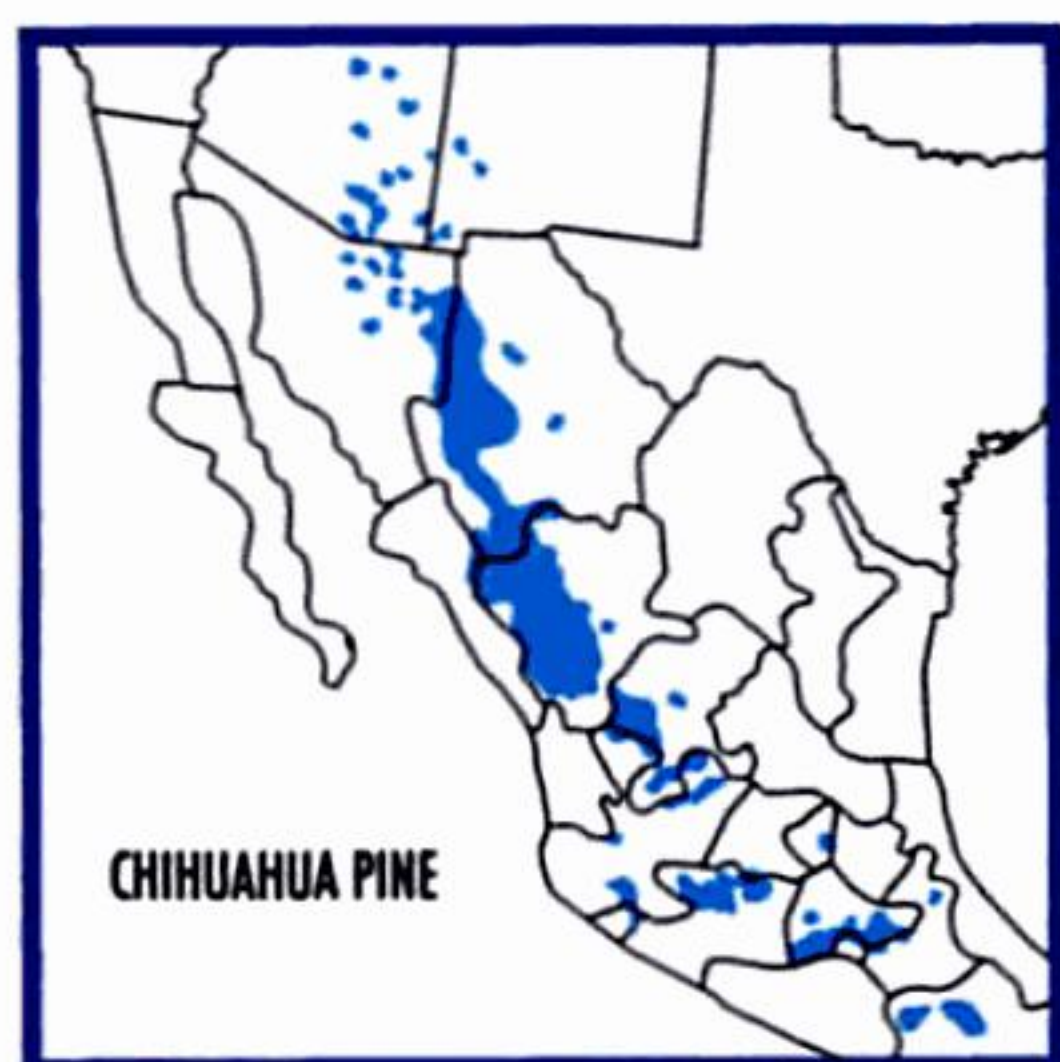
**MEXICAN PINYON** *Pinus cembroides* Zucc. **PL. 3**

A 3- (occasionally 2-4-) needle nut pine with both short needles and short cones. Needles 1-2½ in., blue-green, thin, with leaf sheaths soon shed. Cones 1-2 in. long, short-stalked, at least as wide as long, with broad scales and no prickles. Trunk gray-brown, furrowed. Nuts dark, wingless, ½-¾ in. long. Height 15-20 (30) ft.; diameter to 1 ft. Dry slopes. **SIMILAR SPECIES:** No other 3-needle pine has such short needles. **REMARKS:** Sometimes called Three-needle Pinyon. It would be convenient if the species could be more widely known by that name. Then, if Parry Pinyon (Pl. 5) could be known as Four-needle Pinyon, there would be a nice set beginning with Singleleaf and Two-needle pinyons (Pl. 1). The nuts of all are excellent eating, especially when roasted.

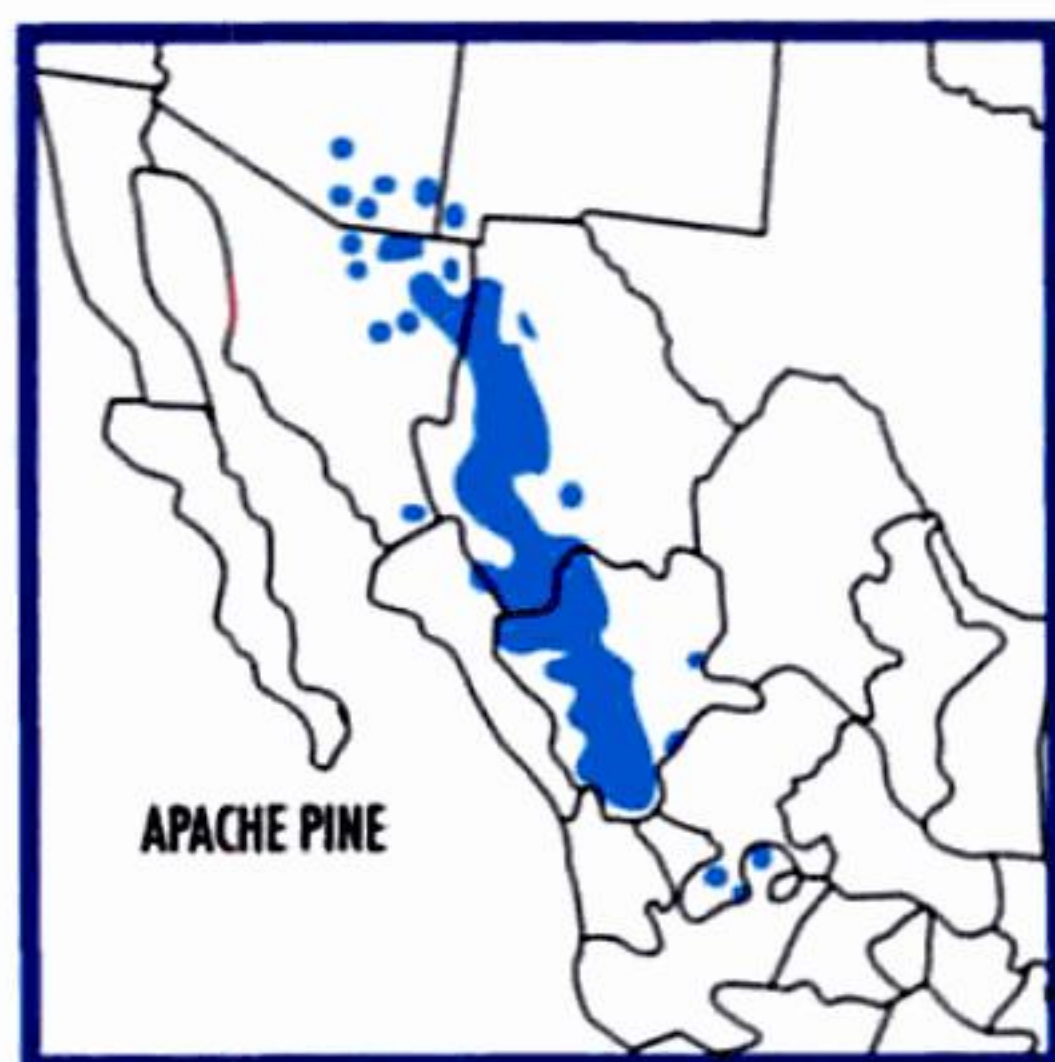
**CHIHUAHUA PINE** *Pinus leiophylla* Schiede & Deppe **PL. 3**

This small tree, though a white pine, has 3-leaved needle clusters 2½-4 in. long. Needles are slender, blue-green, double white-striped (use lens), and with deciduous leaf sheaths under ⅙ in. long. The 1½-3 in.-long cones are only very slightly prickly. They are long-stalked (½ in.) and, atypically, may remain on the tree for several years. Trunk nearly black, often with light tan underbark in vertical fissures. Stumps may sprout. Seed ⅛ in.; wing ⅝ in.





CHIHUAHUA PINE



APACHE PINE

Height 35–50 (80) ft.; diameter 1–2 ft. Dry slopes, 5000–8000 ft. elevation, cen. Mexico to cen. and se. Ariz. and sw. N.M. **SIMILAR SPECIES:** (1) Mexican Pinyon foliage is shorter and more dense while (2) Apache and (3) Ponderosa pines have longer needles and needle sheaths. No other tree of this plate has long-stalked cones or ones that remain on the tree for very long. **REMARKS:** The name of the Mexican state and of this pine is pronounced chee-WAH-wah.

#### APACHE PINE *Pinus engelmannii* Carr.

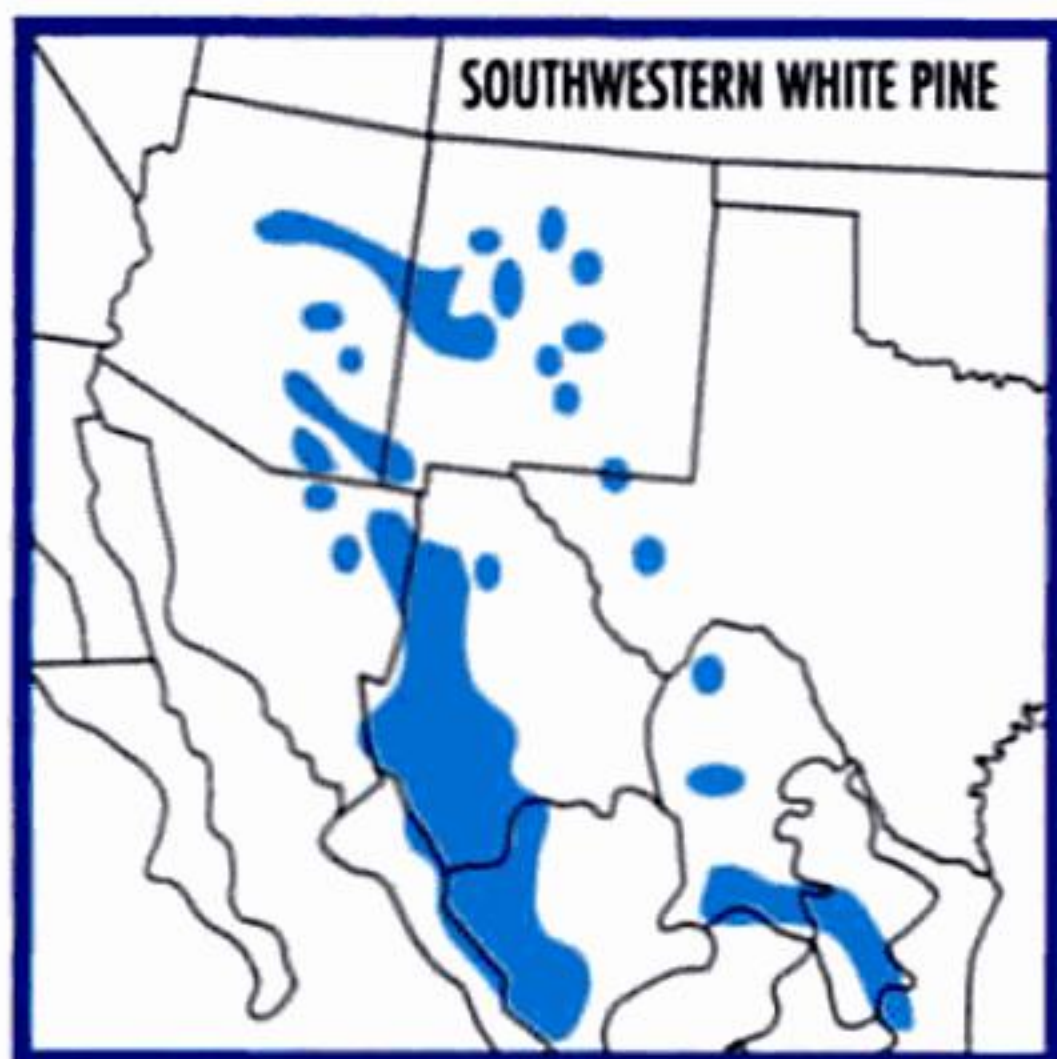
PL. 3

A medium-size tree of limited U.S. distribution with long needles in large clusters at the ends of thick twigs. The dark green 3-needle clusters (rarely twos or fives) are 8–15 in. long, with durable basal sheaths 1–1½ in. long. Mature trees with few branches. Twigs dark, *thumb-wide*, very stout as seen against the sky. Cones short-stalked, 4–6 in. long, often in pairs and threes, scales light brown beneath, and with short, sometimes-curved prickles. Seed ⅝ in.; wing 1 in. Mature bark in yellow plates. Height 50–60 (75) ft.; diameter 1–2 (3) ft. Found between 6000 and 8000 ft. elevations. **SIMILAR SPECIES:** Ponderosa Pine has shorter needles (usually only 4–8 in. in Ariz.), shorter leaf sheaths, thinner twigs, and darker cones. **REMARKS:** Native Americans made wicker canteens and waterproofed them with the resin that oozed from the trunks after the bark was removed. Early peoples are reported to have chewed the inner bark when other foods were scarce.

#### 5-NEEDLE PINES WITH NEEDLES 2½–13 IN. LONG (PLATE 4)

The white (or soft) pines have 5 *blue-green* needles per cluster, each cluster bound at the base by a papery sheath. Unlike the yel-





low pines, this sheath is *soon shed*, leaving only a remnant  $\frac{1}{32}$ – $\frac{1}{16}$  in. long. The needles of white pines also are more *slender* than those of yellow pines, and the branches are whorled at regular annual intervals along the trunk. Typically, cones of white pines are long-stalked, slender, and drop soon after maturity. They can usually be found beneath the parent tree and provide a good clue to identification. They have thin

scales ending in slender prickles or none.

Atypically, Southwestern White Pine has short-stalked cones, while Arizona and Torrey pines, although members of the yellow pine group, have 5 needles per bundle. The needles of the species of this plate rarely are as short as those of the pines on Pl. 5.

## SOUTHWESTERN WHITE PINE

PL. 4

*Pinus strobiformis* Engelm.

Found from the mountains of cen. Mexico north to cen. Ariz., cen. N.M., and w. Texas, this pine has thin needles  $2\frac{1}{2}$ –3 in. long. The best field mark is provided by the short-stalked, moderately heavy, and *elongate* 5–9 in. cones whose blunt scale tips are *bent back*. Seed  $\frac{3}{8}$  in.; wing  $\frac{1}{8}$  in. or less. Bark brownish. Height 60–80 (100) ft.; diameter 1–2 (3) ft. Dry slopes, 5000–10,000 ft. elevation. **SIMILAR SPECIES:** The only white pine in its region (Limber Pine, Pl. 5, comes close in cen. N.M.). Slender needles, long cones, and reflexed cone scale tips are distinctive. Arizona Pine has long needles and needle sheaths plus short prickly cones. **REMARKS:** Sometimes classed as a variety of Limber Pine (Pl. 5). Though edible, the nuts have shells that are thick and hard to crack. Also known as Mexican White Pine, but so are other species of Mexico. Common at the ski lodge and other high elevations on Mt. Lemmon, just east of Tucson, Ariz.

## SUGAR PINE *Pinus lambertiana* Dougl.

PL. 4

The world's largest pine and the one with the longest cones. Needles are blue-green,  $2\frac{1}{2}$ –4 in. long, mostly with needle tips long-pointed (use lens). Cones long-stalked, 11–20 in. long, slender, with mature scales 1–1½ in. wide. Seed  $\frac{3}{8}$  in.; wing 1 in. and *wider* than seed, with tip broadly *rounded*. Mature trunk bark brown or gray, in vertical *ridges*. Height 180–200 (250) ft.; diame-





*Bark of Sugar Pine*



ter 3–6 (8) ft. Cool slopes and deep soils from w. Ore. to Baja California Norte, mostly at 4000–9000 ft. elevations in the Sierra Nevada and s. Cascades. **SIMILAR SPECIES:** Western White Pine has finely checkered bark and a pointed seed wing. **REMARKS:** A tall, columnar tree of great beauty. Its soft, clear wood has value in cabinetwork, veneer backing, house interiors, and shingles. Longevities of 300–600 years have been reported. The common name derives from sweet exudations that occur at the edges of wounds. These, as well as the seeds, were eaten by Native Americans and early settlers.

## WESTERN WHITE PINE

PL. 4

*Pinus monticola* Dougl. ex D. Don

Distributed mainly as scattered specimens in mountains of the Pacific Northwest, this 5-leaved pine has blue-green needles 2½–4 in. long and tips short-pointed (use lens). Cones usually hang from tips of high branches and on the ground nearby. They are long-stalked, 5–10 in. long, *narrowly cylindrical*, and with mature scales ½–¾ in. wide. Seed ⅜ in.; wing 1 in. and not much wider than the seed, with tip pointed. Mature trunk bark gray or brown, finely fissured or in distinctive small *square plates*. Height 100–165 (225) ft.; diameter 3–5 (7) ft. Heavy snowfall areas at





*Bark of Western White Pine*

medium elevations in the n. Rockies and Cascades to the cen. Sierra Nevada and w. Nev. **SIMILAR SPECIES:** (1) Sugar Pine has ridged mature trunks, much longer cones, wider cone scales, and a rounded seed wing. Difference in shape of needle tips may require direct comparison. Sugar Pine does not occur in the n. Cascades or Rocky Mt. portions of the Western White Pine range. (2) Limber and (3) Whitebark pines (Pl. 5) have shorter cones and thicker cone scales and occur mostly at higher elevations. **REMARKS:** A large tree and an important timber species, but generally uncommon. The source of most wooden matches. Like other 5-needle pines, it is susceptible to blister rust (transmitted via currant and gooseberry shrubs) but being controlled. Seeds consumed by squirrels and chipmunks. May live 200–500 years.

**TORREY PINE** *Pinus torreyana* Parry ex Carr.

**PL. 4**

This localized 5-leaved member of the yellow pine group is native only on about 2 square miles of coastal hills in San Diego Co., Calif., and again 175 miles northwest on Santa Rosa I. Needles 8–13 in. long, dark green, and with *persistent* needle sheaths. Twigs  $\frac{1}{4}$ – $\frac{1}{2}$  in. thick. Cones 4–6 in. long, *long-stalked*, dark brown, with *thick* pointed *closed* scales sometimes tipped with small



prickles. Cones sometimes persistent. Seed  $\frac{3}{4}$ –1 in.; wing  $\frac{1}{2}$  in., nearly surrounding the edible nut. Bark dark, furrowed. Height 20–30 (50) ft.; diameter 1–2 ft. **SIMILAR SPECIES:** Arizona Pine occupies a different area. It has smaller cones and thicker twigs. **REMARKS:** Often dwarfed and twisted by ocean winds. More widespread in earlier geological times; now the pine with the most limited natural range. Common, however, at Torrey Pines State Reserve north of San Diego. Planted in some California parks and reportedly introduced into New Zealand and Kenya. Seeds said to be edible.

## ARIZONA PINE

PL. 4

*Pinus ponderosa* var. *arizonica* (Engelm.) Shaw

Like typical Ponderosa Pine (Pl. 3) but with 5 needles and short-stalked *open* cones only 2–3½ in. long. Some 2- and 3-needle clusters may be present. As one of the yellow pines, the leaf sheaths are long and *persist* at the bases of the needle bundles. Twigs  $\frac{1}{2}$ –1 in. thick. Height 80–100 ft.; diameter 2–3 (4) ft. Canyon slopes, 6000–8000 ft. elevation, from nw. Mexico north to se. Ariz. and sw. N.M. **SIMILAR SPECIES:** See (1) Southwestern White and (2) Torrey pines.

## 5- (OR 4-) NEEDLE PINES WITH NEEDLES 1–2½ IN. LONG (PLATE 5)

Like the three members of the white pine group on Pl. 4, these species have short ( $\frac{1}{32}$ – $\frac{1}{16}$  in.) needle sheaths and early-falling cones with prickles small or lacking. The cones of these several species, however, have *short* stalks. All except Parry Pinyon grow mainly at rather high elevations and have 5 needles per cluster. The needles are only 1–2½ in. (sometimes 3 in.) long.

Three small subgroups of white pines are involved here. Bristlecone Pine and Foxtail Pine together are called foxtail pines. While in most pines the needles are bunched at or near the branch ends, in these two species the needles are retained along the last 10 years or so of branchlet growth, giving the appearance of a long furry fox tail to the outer branch. The needle sheaths of these two species are more persistent than for the following three. Parry Pinyon, like the other pinyons (Pls. 1 and 3), is a nut pine with short, wide-scale, open cones that produce tasty and nutritious nuts. Whitebark and Limber pines, in the third group, are high-elevation and timberline species that resemble the Swiss Stone (Arolla) Pine (*P. cembra* L.) of central Europe. The group is known as stone pines.

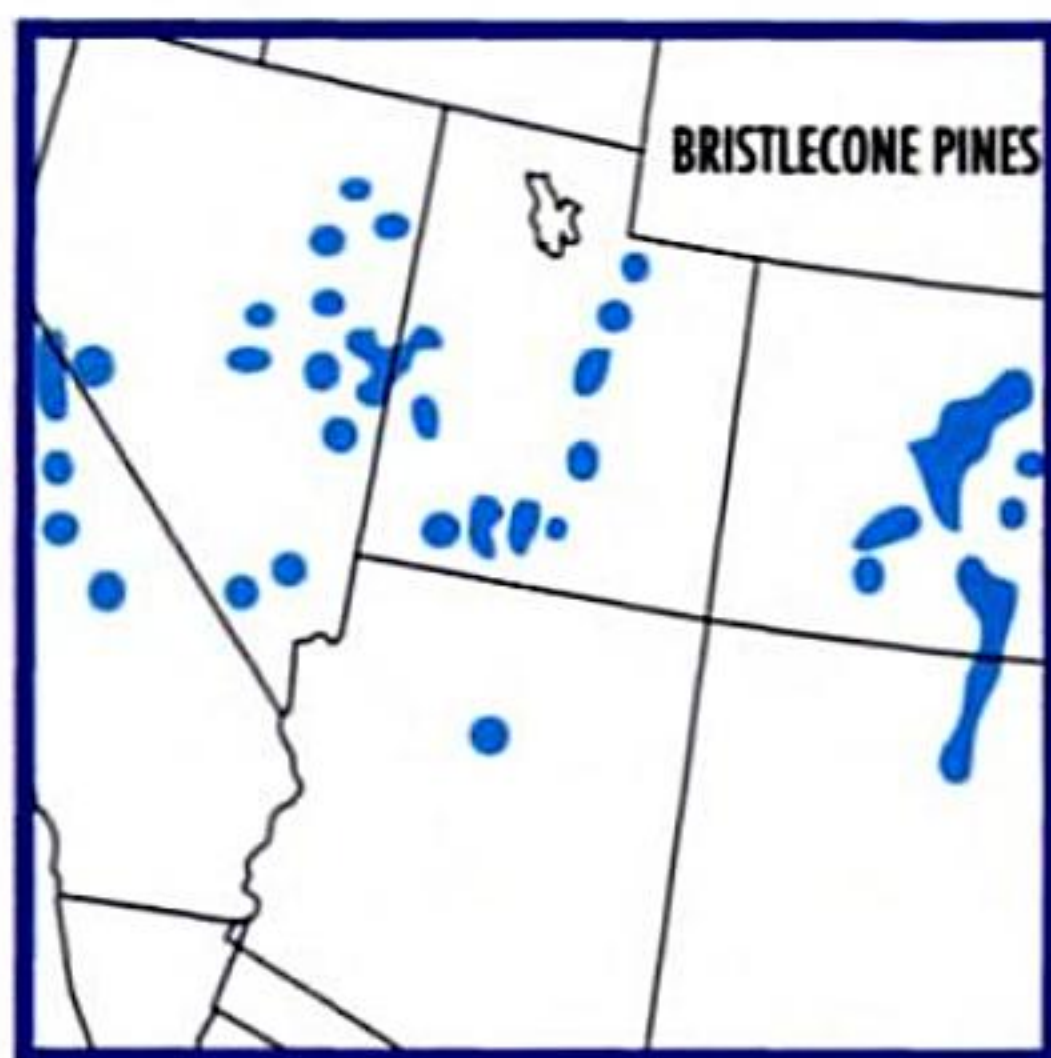


*Pinus longaeva* D. K. Bailey

The oldest Bristlecone Pines display gnarled and often bare trunks; they seem to be more dead than alive. Yet, after living for more years before the time of Christ than have elapsed since then, some of these venerable trees still survive in the dry, desert mountains of the Great Basin region. Needles in clusters of 5, dark green, only 1–1½ in. long, and held for 10–20 years in bushy *foxtails*. Cones cylindrical, thin-scaled, 3–3½ in. long, and with *rounded* bases. Cone scales slender, mostly with straight, barely prickly *bristles* ⅙–¼ in. in length. Seed ⅜ in.; wing 1 in. Bark brownish. Trunk often forked. Height 15–40 ft.; diameter 1–2½ ft. Near timberline, rocky ridges, scattered locations. **SIMILAR SPECIES:** (1) Foxtail Pine occurs only on high mountains in n. Calif. and again in the s. Sierra. Its foliage is similar, but the cones have narrow bases and very small incurved prickles or none. (2) Limber Pine has needles in short tufts, not foxtails. **REMARKS:** Found to outclass both Redwood (Pl. 8) and Giant Sequoia (Pl. 10) as the longest living trees; the oldest surviving specimen has been dated as at least 4600 years of age. A scattered forest of these trees, including the oldest known, can be seen on the White Mountains at about 8500 ft. elevation in the Inyo Nat'l. Forest east of



Colorado Bristlecone Pine







Bishop, Calif. The history of past climates has been recorded in the trees' growth rings, giving rise to the science of dendrochronology. Bristlecone growth rings of known age have enabled improved precision in the radiocarbon dating of ancient organic materials found elsewhere. But see Quaking Aspen, p. 286.

## COLORADO BRISTLECONE PINE

NOT SHOWN

*Pinus aristata* Engelm.

Also called Rocky Mountain Bristlecone Pine and found in Colo., n. N.M. and n. Ariz. (San Francisco Mt.), this tree is distinguished from *P. longaeva* by needles strongly grooved and bearing a "dandruff" of tiny resin spheres on fresh foliage. It also has cone prickles  $\frac{1}{4}$ – $\frac{3}{8}$  in. long.

## FOXTAIL PINE *Pinus balfouriana* Grev. & Balf.

PL. 5

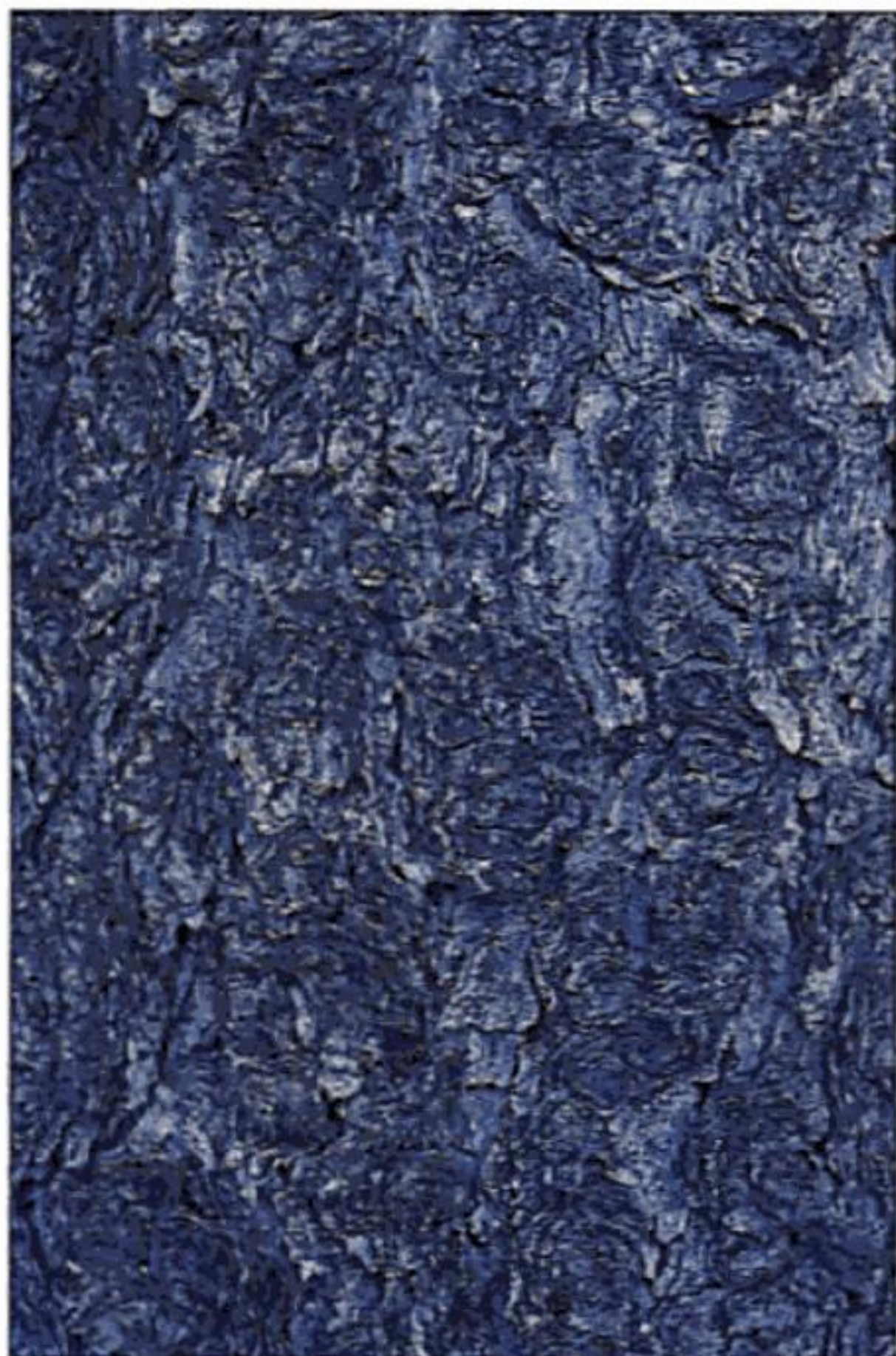
Closely related and with foliage lacking a strong groove but otherwise much like that of the bristlecone pines. Cones 3–4 in. long with *tapered* bases and prickles *absent* or under  $\frac{1}{16}$  in. long. This species occurs only in the s. Sierra (Tulare and Inyo counties) and again in the Klamath Mts. (Trinity and Siskiyou counties) of n. Calif. It is not reported from the White Mts. of Inyo Co., the most westerly location of Intermountain Bristlecone Pine. Longevity is believed not to exceed 350 years. A high-elevation tree, mostly at 6500–7500 ft. Distributed more widely in earlier geologic time. John H. Balfour, a 19th-century botany professor, sponsored John Jeffrey in his California botanical explorations.

## PARRY PINYON *Pinus quadrifolia* Parl. ex Sudw.

PL. 5

A localized nut pine with mostly 4-leaved, yellow-green needle clusters and short cones with a *few* thick scales. Leaves 1–1  $\frac{1}{2}$  in. long; cones 1  $\frac{1}{2}$ –2  $\frac{1}{2}$  in., sometimes with a small prickle. Nuts  $\frac{3}{4}$  in.





*Bark of Parry Pinyon*

long and wingless or nearly so. Trunk gray to brown and scaly. Height 15–30 ft.; diameter 1–1½ ft. Dry slopes at 4000–6000 ft. elevation, native in Riverside and San Diego counties, sw. Calif., and in Baja California Norte. **SIMILAR SPECIES:** This species may occasionally have 3-leaved needle clusters, but the only other pine in the area with short needles is the 1-needle Singleleaf Pinyon.

**REMARKS:** Like the Singleleaf, Two-needle (Pl. 1), and Mexican (Pl. 3) pinyons, this species produces delicious nuts.

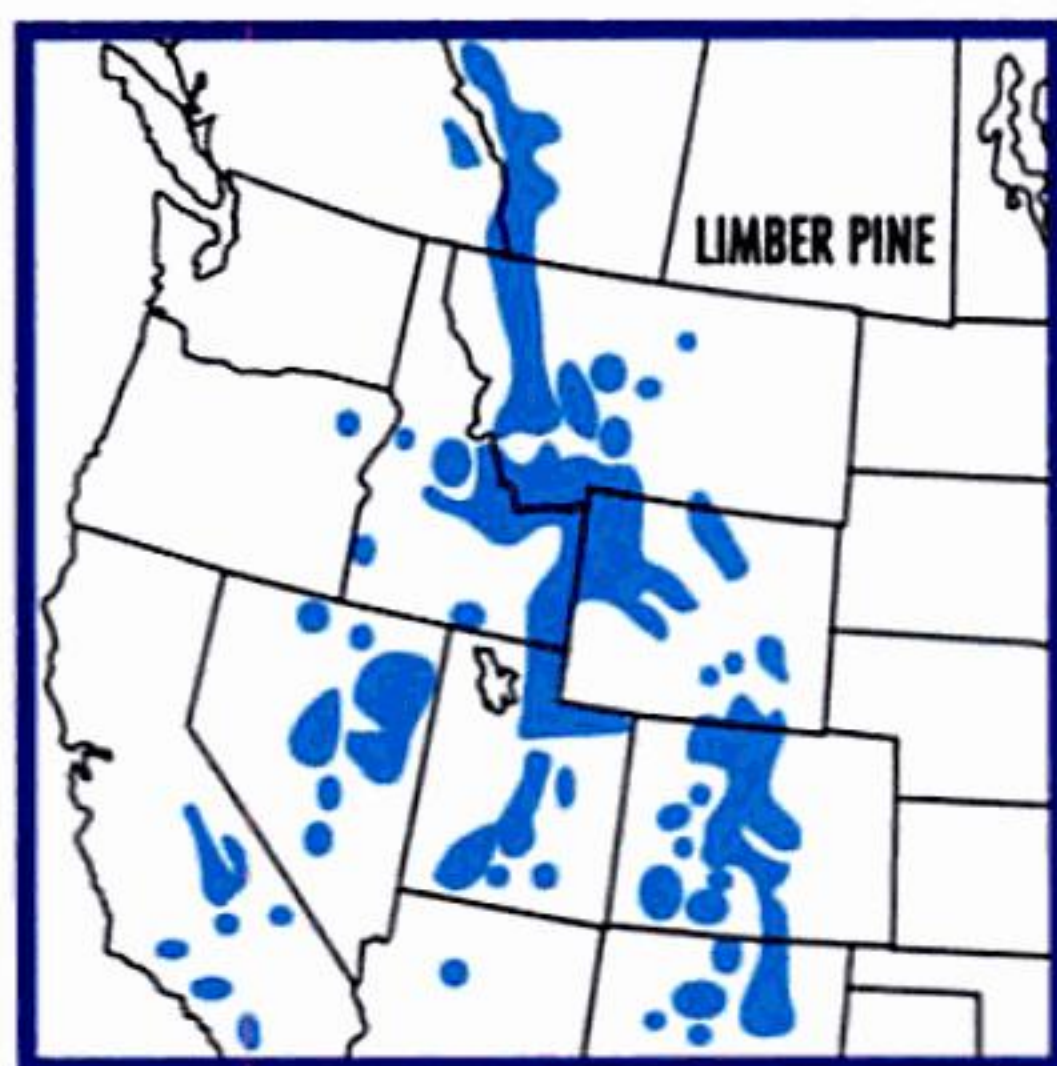
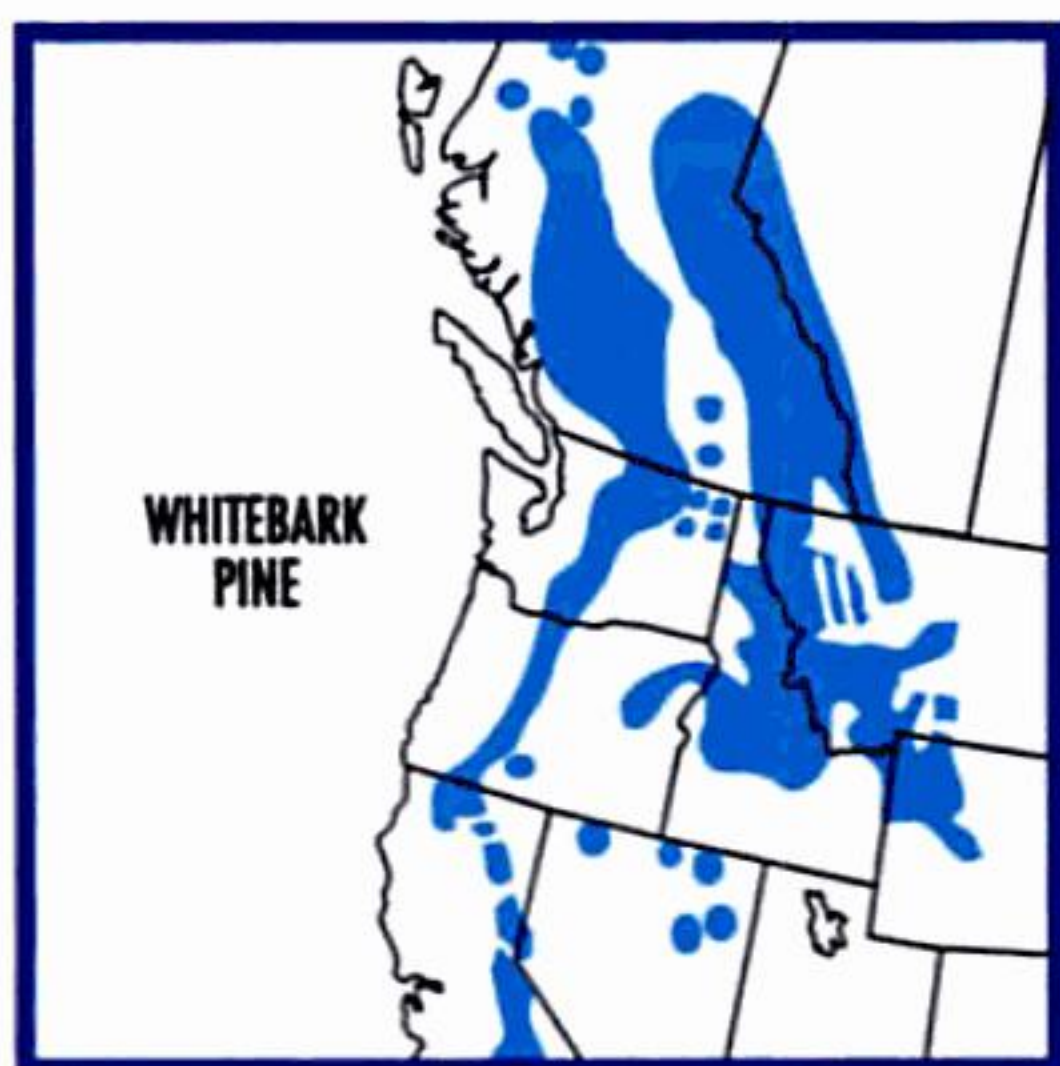
#### WHITEBARK PINE *Pinus albicaulis* Engelm.

**PL. 5**

A tree of high elevations, often with several trunks and frequently windblown and shrubby. Needles yellow-green in 5-leaved bundles, 1½–2½ in. long. Twigs very flexible. Cones 1–3 in., *dark purple*, and with scales *thick* and *pointed* (but not prickly). Cones may disintegrate on the tree or may remain *closed* whether or not they fall. The presence of purplish brown cone fragments scattered by seed-eating wildlife may identify the tree as a Whitebark Pine even if whole cones are absent. Seed ¼ in., dark brown; wing small or absent. Trunk bark not distinctive, rather smooth, in gray or whitish plates. Height 15–30 (60) ft.; diameter 1–2 (3) ft. Rocky slopes at 5000–12,000 ft. elevations. **SIMILAR SPECIES:** Limber Pine is best separated by its larger, light brown, open cones. Both it and Whitebark Pine have highly flexible twigs that withstand winter winds and the weight of timberline snow. Limber Pine is absent from the Pacific Northwest west of the Continental Divide, while Whitebark Pine does not occur in the s. Rocky Mts.

**REMARKS:** Squirrels, chipmunks, and birds (especially Clark's nutcracker) often harvest the cones before they can be examined by the naturalist. Believed to live 250–350 years.





## LIMBER PINE *Pinus flexilis* E. James

PL. 5

Like Whitebark Pine, a 5-leaved high-altitude pine with flexible twigs and yellow-green needles  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long. Limber Pine cones, however, *open* readily at maturity to allow the seeds to fall. Cones are 3–6 in. long, *light brown*, with scales only somewhat thickened and tips *rounded*. Seed  $\frac{3}{8}$ – $\frac{1}{2}$  in., red-brown, and *dark-mottled*; wing small or lacking. Mature trunk bark brownish to black, furrowed. Height 35–50 (80) ft.; diameter 1–2 (3) ft. Dry ridges 5000–12,000 ft. elevation, mainly in Rocky Mts. **SIMILAR SPECIES:** See (1) Whitebark Pine in areas where the ranges of the two species overlap, mainly in the n. Rockies and s. Sierra. In cen. N.M. see also (2) Southwestern White Pine (Pl. 4). **REMARKS:** Though the flexible twigs of this species give it its name, those of Whitebark Pine seem equally capable of being tied in knots. Some few Limber Pines are reported to live as long as 2000 years. Limber Pine is common and is the only pine in Craters of the Moon Nat'l. Monument near Arco, Idaho.

## CONIFERS WITH SINGLE NEEDLES ON WOODY PEGS: SPRUCES (PLATE 6)

Spruces have single needles, not clustered. When spruce needles fall, the twigs and branchlets remain *rough* from the small but stout persistent *woody pegs* that support the needle bases. Hemlocks (Pl. 8) have only weak pegs. Other conifers lack these pegs.

Spruces are ornamental, sharply steeple-shaped evergreen trees of cold climates whose needlelike leaves are mostly more or less 4-sided and can easily be twirled between the fingers. In two species, however, they are rather flattened and cannot easily be twirled. Needles are more broadly white-striped in these two species. Spruce needles are short and tend to be stiff and some-





what sharp. They grow all around the twigs. Like firs, spruce branchlets are tipped with twigs arranged in the shape of Christian crosses.

Spruce cones are brown and woody when mature. Unlike fir cones, those of spruces hang pendent and do not fall apart on the tree. Spruce cone scales are *thin*, not heavy or thorny as in pines. Trunk bark is brown and often *scaly*.

Spruces grow north to the limit of trees, forests thinning to dwarf specimens extending far into the tundra. To the south, some species persist on high mountains as far south as s. N.M. They are absent, however, from the Sierra Nevada proper.

Spruces do not make satisfactory Christmas trees: their needles fall quickly upon drying. The wood is soft, light, resinous, and straight-grained. It provides a principal source of pulp for making paper and is valuable for construction work, interior finishing, and boatbuilding. Tannin and "burgundy pitch," used in varnishes and medicinal compounds, come from the bark of certain species. In Europe some spruces are tapped for turpentine, and in times of food shortage the inner bark has been ground and added to flour. Spruce beer, it is reported, is made from fermented needles and twigs that have been boiled with honey. Several spruces are of value in landscaping.

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SITKA SPRUCE *Picea sitchensis* (Bong.) Carr.

PL. 6

Distributed from s. Alaska to n. Calif., this coastal fog-belt species has needles sharp, *flattened*, dark green, white-striped, and  $\frac{3}{4}$ –1







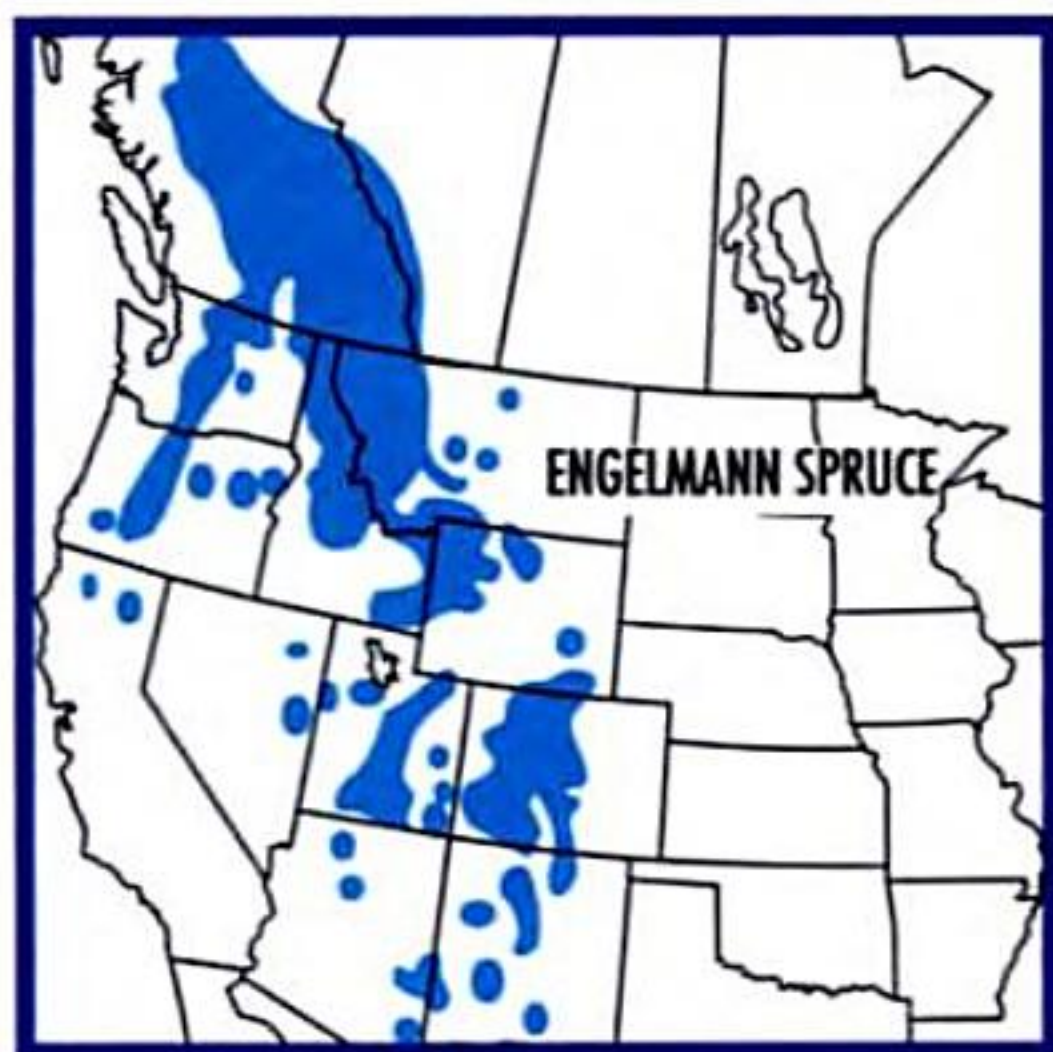
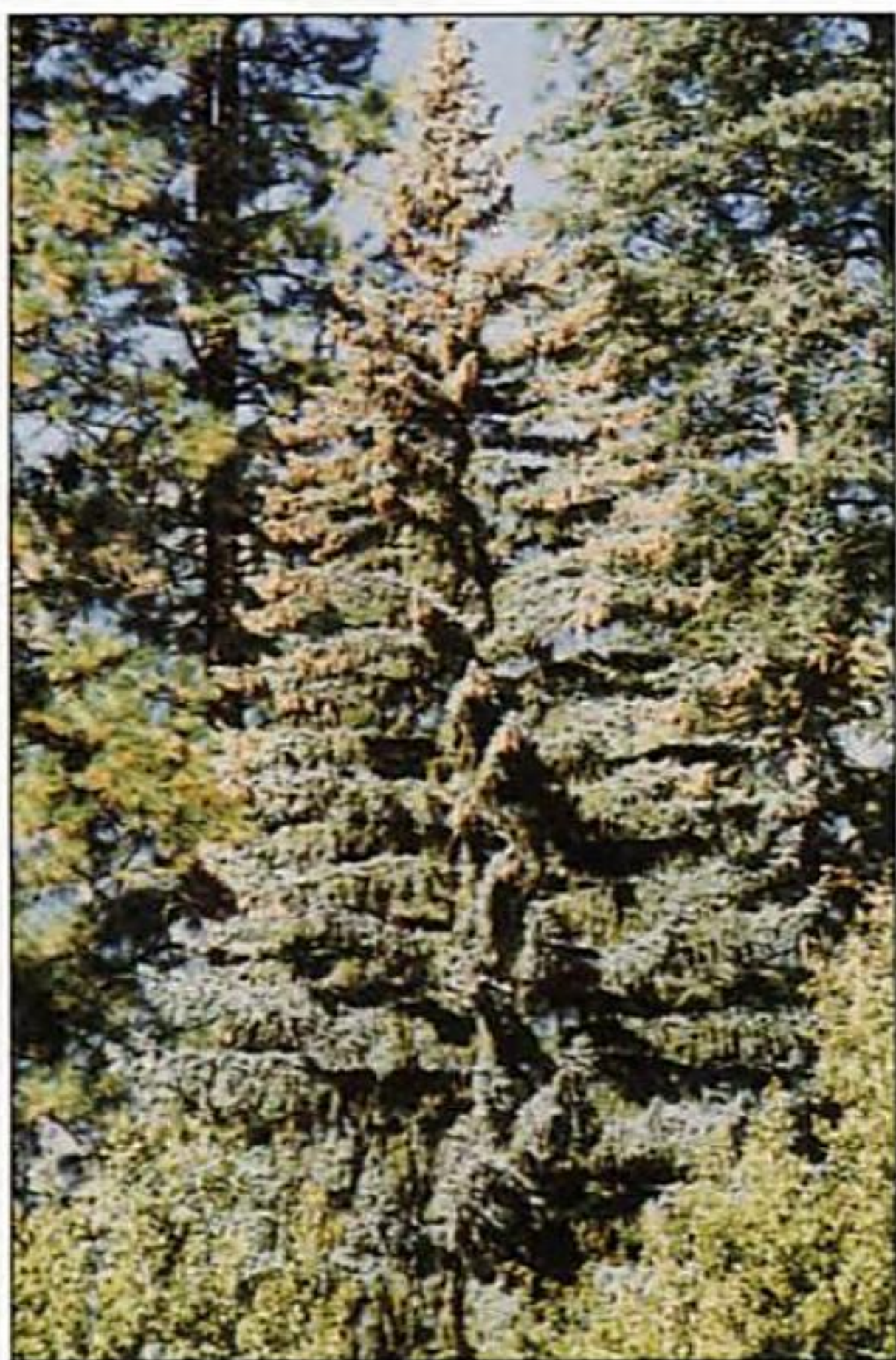
in. long. Twigs *droop* and are *hairless*. Cones 2–4 in. long with scale tips *narrowed* and somewhat ragged. Trunk base of large trees often enlarged and *buttressed*. Shrubby at its northern limits but may become 100–160 (215) ft. tall and 3–4 (17) ft. in diameter elsewhere. **SIMILAR SPECIES:** Resembles (1) Douglas-fir at a distance, but trunk is scaly rather than furrowed. Flat needles occur also in Douglas-firs and (2) some true firs, but their dead twigs lack stout woody needle bases and their cones differ. (3) Weeping Spruce, also with flattened needles, has twigs and branchlets usually hanging “weeping” to 4–8 ft., twigs hairy, and cone scales broad, not ragged. Our other spruces have 4-angled needles. **REMARKS:** Our largest spruce and a valuable lumber species. In 1841, members of the Charles Wilkes’ American exploring expedition found logs 300 ft. long and 20 ft. in diameter. Certain logs have resonant qualities and are of value for musical instruments. Native Americans wove baskets of the rootlets. Some trees live to be 700–800 years old. Fine stands can be seen in the Hoh Valley at Olympic Nat’l. Park, Wash. Widely planted for timber in Great Britain.

#### WEeping SPRUCE *Picea breweriana* S. Wats.

PL. 6

Native only near the Calif.-Ore. border. This uncommon spruce has needles *flattened*,  $\frac{3}{4}$ –1 in. long, somewhat blunt, yellow-green, white-lined, and spreading in all directions. Branches and thin branchlets hang *pendent* up to 8 ft. in length. Twigs *hairy*. Cones 2–4 in. with *broadly rounded* and *even-edged* scales. Trunk base often enlarged. Height 80–100 ft.; diameter 1–2 ft. High, dry slopes of the Siskiyou Mts. and nearby. **SIMILAR SPECIES:** See Sitka Spruce. **REMARKS:** Also called Brewer Spruce. William H. Brewer, a Yale University professor, discovered the species during the 1800s. Tree may not weep strongly until mature.





*Engelmann Spruce*

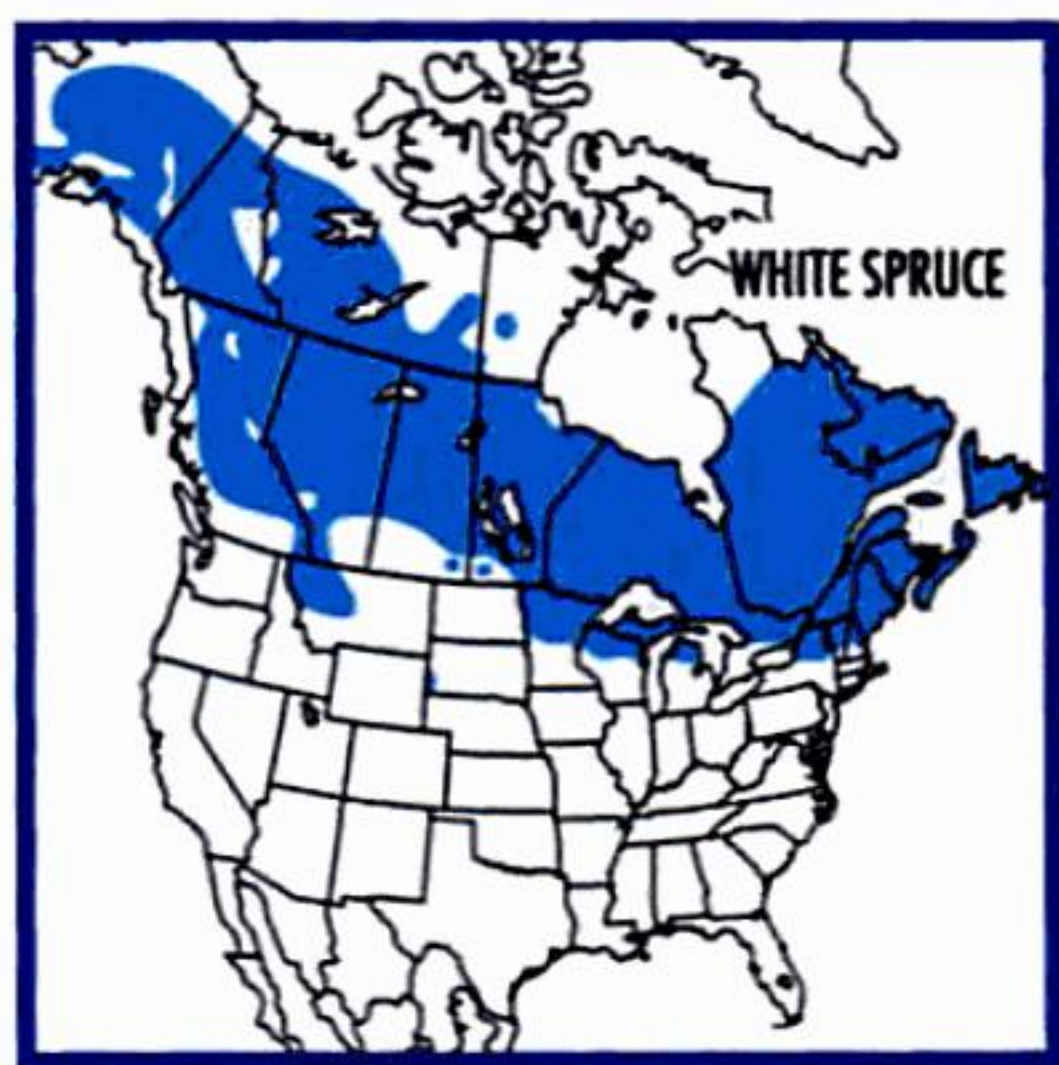
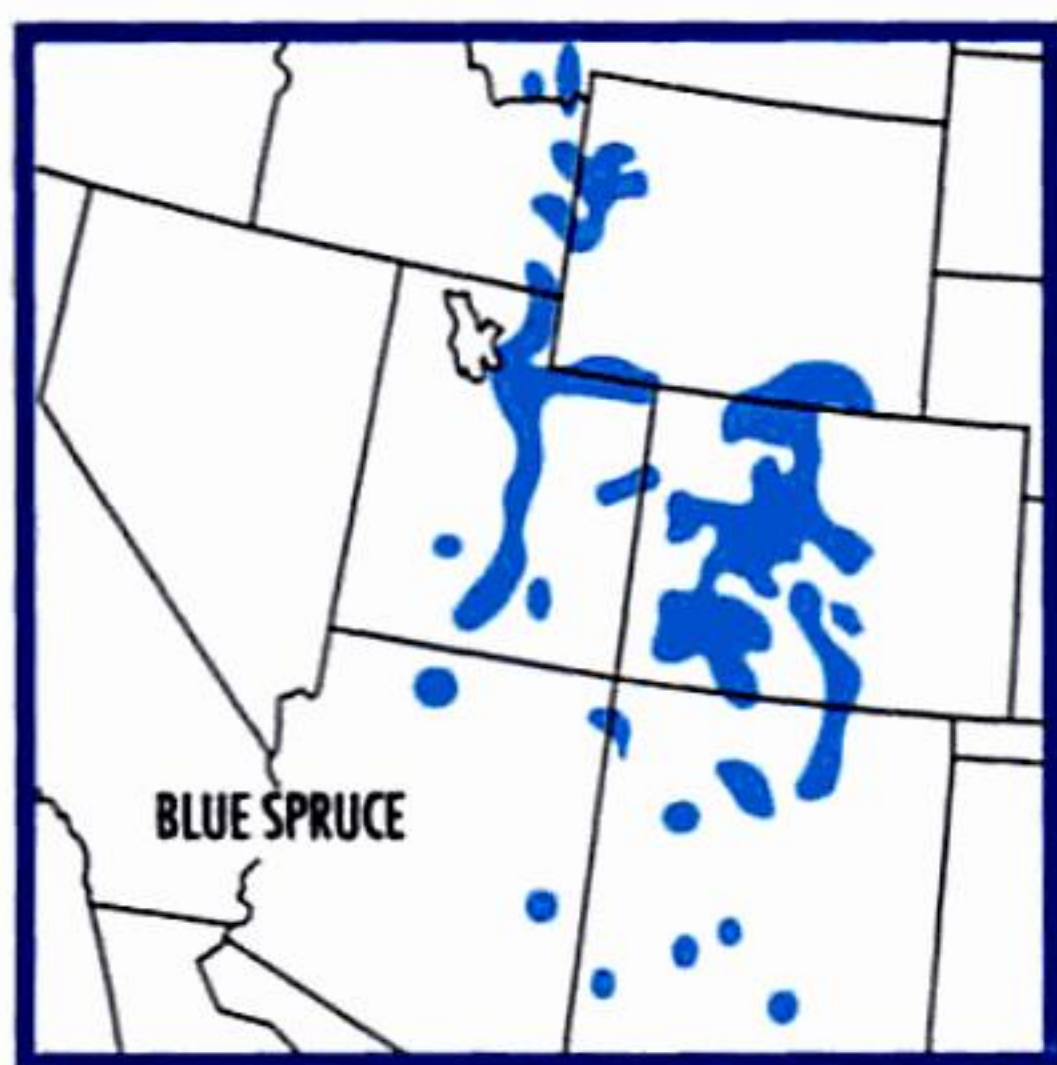
## ENGELMANN SPRUCE

PL. 6

*Picea engelmannii* Parry ex Engelm.

As the principal spruce of inland western mountains, Engelmann Spruce has dark- to blue-green, 4-sided, rather *flexible* needles mostly  $\frac{3}{4}$ –1 in. long, not very sharp to the touch. Twigs mostly *fine-hairy*. Cones  $\frac{1}{2}$ –2 (3) in. with middle scales usually *diamond-shaped* and scale tips *ragged* and *narrowed*. The tip of the seed wing impression on the cone scale is *less than*  $\frac{3}{16}$  in. from the end of the scale. Light brown cones often crowded at tree top and numerous beneath the tree. Trunk bark of large trees *light brown*, *thin* ( $\frac{1}{4}$ – $\frac{1}{2}$  in.), and *scaly*, often resembling that of Lodgepole Pine (Pl. 1). Height 80–120 (180) ft.; diameter 1–3 (8) ft. and crown narrow. Moist slopes and canyons from cen. B.C. and sw. Alta. to n. Calif. and s. N.M. at 5000–11,000 ft. elevations. **SIMILAR SPECIES:** (1) Blue Spruce has a more restricted range, darker and thicker trunk bark, somewhat stiffer and sharper needles, usually hairless twigs, mostly larger cones with rounded middle scales, and a more-distant seed wing impression. See also (2) White Spruce and (3) Subalpine Fir (Pl. 7). **REMARKS:** A major lumber tree. Wood is made into boxes and construction timber but also is reported, like Sitka Spruce, to have resonant qualities of value in making





pianos and violins. Paper pulp is an important product. Where ranges overlap in the n. Rockies, intergradation with White Spruce has been found. One study determined that natural hybrids with Blue Spruce do not occur. Blacktail and whitetail deer and bighorn sheep browse the twigs, porcupines feed on the growing layers beneath the outer bark, and dusky grouse and red squirrels eat the seeds. Trees over 500 years old have been recorded. George Engelmann was a midwestern 19th-century physician and botanist who specialized in conifers.

#### BLUE SPRUCE *Picea pungens* Engelm.

PL. 6

A tree of the central Rocky Mts. with needles *stiff, sharp* to the touch,  $\frac{3}{4}$ – $1\frac{1}{4}$  in. long, and green to *blue-green*. Twigs mostly *hairless*. Cones  $2\frac{1}{2}$ –4 in. long, with central scales mostly *rounded*, and scale tips *ragged* and *narrowed*. The seed wing impression ends  $\frac{5}{16}$ – $1\frac{3}{32}$  in. from the cone scale tip. Trunk bark of large trees *dark, thick* ( $\frac{3}{4}$ – $1\frac{1}{2}$  in.), and *furrowed* rather than *scaly*. Height 80–100 (150) ft.; diameter 1–2 (3) ft. Stream bottoms and other moist soils at 6000–11,000 ft. elevations from sw. Montana, e. Idaho and w. Wyo. to s. N.M. **SIMILAR SPECIES:** See Engelmann Spruce, from which it is not always distinguishable with certainty. **REMARKS:** Widely used in landscaping. Wild trees seldom as markedly blue as cultivated varieties.

#### WHITE SPRUCE *Picea glauca* (Moench) Voss

PL. 6

A northern transcontinental species. Needles  $\frac{3}{8}$ – $\frac{3}{4}$  in. long, yellow- to blue-green and often massed on the twig tops by means of twisted lower needles. Twigs *hairless* (use lens after removing needles). Cones *cylindrical*,  $1\frac{1}{4}$ –2 in. long, *dropping* soon after maturing; scales rounded and *flexible* with edges nearly *smooth*. In the far north and on high mountains a low matlike form occurs in





*White Spruce*

exposed locations. Height 50–60 ft.; diameter 1–2 ft. Upland tundras and forests from the northern limit of trees south to the Black Hills of S.D. and ne. U.S. **SIMILAR SPECIES:** (1) Black Spruce has hairy twigs and shorter needles. Its cones, which accumulate on the tree, are smaller with rigid and ragged-edge scales. It occurs more common in swamps. In the Canadian Rockies, (2) Engelmann Spruce has longer needles and cones, the latter also with ragged cone scale tips. **REMARKS:** Trees 200 years old are not unusual. Twigs browsed occasionally by whitetail deer, moose, and bighorn sheep. Red squirrels and crossbills eat the seeds; porcupines gnaw the inner bark.

**BLACK SPRUCE** *Picea mariana* (Mill.) BSP.

**PL. 6**

Also a wide-ranging subarctic species. Needles *short*, mostly  $\frac{1}{4}$ – $\frac{7}{16}$  in. long, green or sometimes blue-green with a white powder. Twigs *hairy* (use lens after removing needles). Cones  $\pm$  *spherical*, only  $\frac{3}{4}$ – $1\frac{1}{4}$  in. long, somewhat gray-brown, with scales *stiff* and tips rather *ragged*. Cones usually *remain* on tree for several years. Low matlike forms are known from northern mountains, especially where exposed to severe winds and cold. Height 25–30 ft.; diameter 1–2 ft. Tundras, bogs, and wet soils from the arctic limit of trees s. to cen. B.C., s. Man., and ne. U.S. **SIMILAR SPECIES:** See



White Spruce. **REMARKS:** Some trees survive for 250 years. Snowshoe hares, porcupines, and crossbills have been recorded as feeding on parts of this spruce.

## CONIFERS WITH NEEDLES SINGLE AND FLAT (OR 4-SIDED): FIRS (PLATE 7)

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Like spruces (Pl. 6), firs of the genus *Abies* are evergreen trees of cold climates. These are *true firs*, as distinct from Douglas-firs (Pl. 8). Needles are short and mostly *flat, blunt*, grooved above, white-striped beneath and sometimes above. (Note: Weather and drying both weaken white lines; these are best seen [use lens] on fresh needles at twig ends.) Needles on upper (cone-bearing) branches tend to be more sharply pointed than those on lower branches. Unless otherwise noted, the lower needles are those described here. At least one species has low 4-sided needles, which, in contrast to flat ones, can easily be twirled between the fingers.

The needles of true firs are unlike those of other conifers (except Douglas-firs, see below) in that when plucked they leave smooth *circular scars* on the twig. Newly grown needles are bluish in several species. The winter buds are mostly *blunt* and resin covered.

The cones of true firs are unique but not long-lasting. They mature in late summer and are mostly gone by late September. While immature, they are green to purple and stand *erect*. Their fleshy scales *fall apart* upon ripening, leaving upright but unobtrusive spikelike cores. Cones and their spikes are most frequent on the highest branches. Sometimes cones (or piles of their remains) can be found on the ground after squirrels have cut the small branches that hold them. Cone bracts protrude from between the scales in two firs (and also in Douglas-firs, see below). Young trunks of true firs are pale and mostly smooth, with resinous blisters. Older trees mostly have dark, scaly, or furrowed bark. Topmost leader twigs are erect. The ranges of the several species do not much overlap. Especially in nw. Calif./sw. Oreg., however, hybrid intergrades between species may occur.

Firs are important more for pulpwood than timber, but most species are also widely planted in landscaping. As for many other conifers, effective seedling survival usually requires sunlight. Firs make good Christmas trees, holding their needles even when dry.

True firs and Douglas-firs (Pl. 8) are alike in having circular leaf scars. Douglas-firs differ from true firs, however, in that their needles have thin stalks, their buds are pointed, and their cones





*Grand Fir*

are brown with woody, persistent scales and protruding 3-pointed bracts. Cones are usually abundant on the ground beneath Douglas-firs.

Fir species are most numerous in the Pacific Northwest, especially Ore. In addition to wild populations, the Hoyt Arboretum, Washington Park, Portland, Ore., offers a complete and well-marked display.

**GRAND FIR** *Abies grandis* (Dougl. ex D. Don) Lindl. **PL. 7**

A large tree of the Pacific Northwest and n. Rockies whose flat  $\frac{3}{4}$ –1-in. (2-in.) needles are of *different lengths* and occur in *flat sprays* on the lower branches. They are medium-dark green above, white-lined beneath, and with tips mostly notched (use lens). Twigs clearly *visible* from above. Twigs hairless; buds resin-covered. Cones green and 2–4 in. long. Height 150–200 (250) ft.; diameter 2–3 (5) ft. Moist bottomlands and slopes from sea level to 6000 ft. elevation, s. B.C. and w. Mont. to nw. Calif. **SIMILAR SPECIES:** (1) White Fir has needles whitish above and often curved upward in a broad, shallow U. (2) Silver Fir has needles not in flat sprays. Though its needles sometimes may appear to be of two lengths, they are quite dark above and so dense as usually to hide the twig top. (3) Noble Fir needles are quite thin, all of equal





length and with two white lines above as well as below. Of the several other lowland conifers that have flat needles green above and white-striped below (Pl. 8), the (4) Douglas-firs also display circular leaf scars on dead twigs, but these species, as well as (5) hemlocks have stalked needles and brown, woody, pendent cones. (6) Redwood, (7) California Torreya, and (8) Pacific Yew (all of Pl. 8) have needle bases which extend downward along the twig. **REMARKS:** Rather tolerant of shade and a fast-growing tree, some surviving to about 280 years. The wood is reported to repel insects and sometimes is called Stinking Fir because of an odor that is unpleasant to some people. Hybridizes with White Fir.

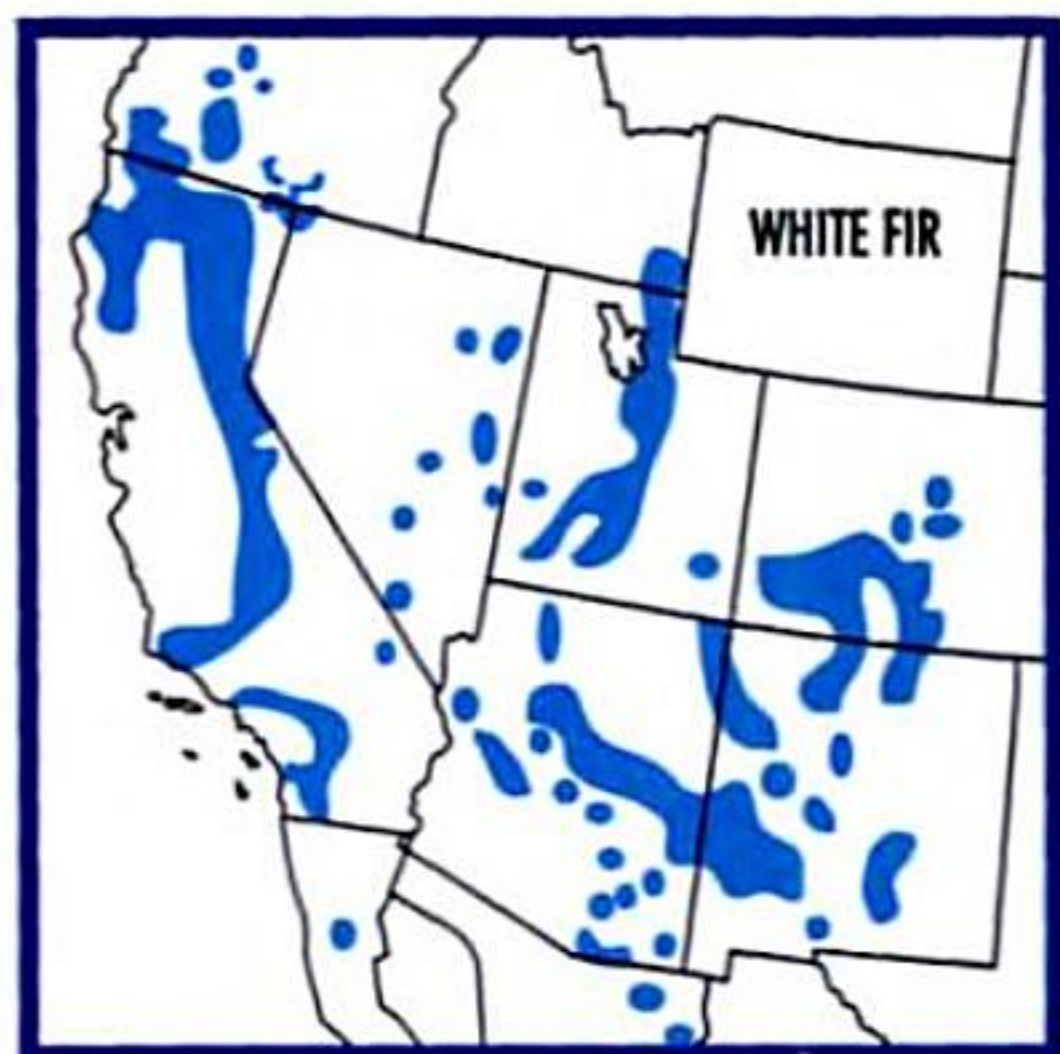
## WHITE FIR

PL. 7

*Abies concolor* (Gord. & Glend.) Hildebr.

A common tree of mountain slopes in the s. Rockies, the Sierra Nevada, and some coastal range locations. The *flat* needles are 1½–2½ in. long, whitish on both sides, mostly blunt, and with a ± narrowed base. The upper surface is smooth, blue-green, *un-grooved*, and white-powdered; there are double white lines beneath. Some needles spread to the sides; others curve upward to form a U. Twigs *hairless*; buds resin-covered. Cones 3–5 in. long, greenish becoming purple or brown at maturity. Trunk bark

### White Fir



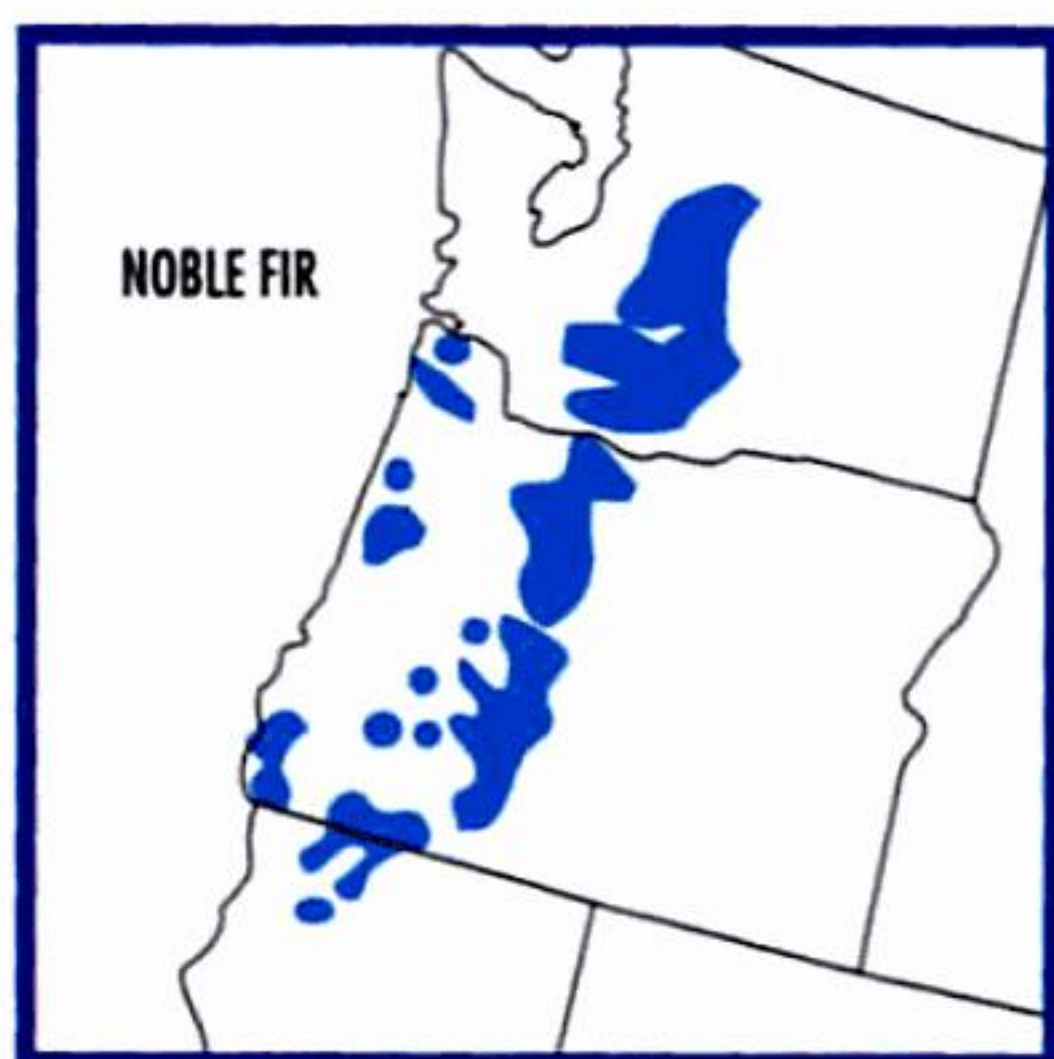


smooth ash-gray when young. Height 100–180 (210) ft.; diameter 2–5 (6) ft. Middle elevations. **SIMILAR SPECIES:** Grand Fir has needles green above, of two lengths, and not U-curved. **REMARKS:** Some specimens live to be 350 years old. Twigs are eaten by blacktail and mule deer, buds and needles by sooty grouse, and seeds by chipmunks and squirrels. Wood, lacking odors, once much used for butter tubs. The specific name refers to the uniformity of color on both surfaces of the needles. Called Concolor Fir in some areas. Hybrids with the following species and with Grand Fir are common where they occur together. Specimens from the Sierra Nevada and n. Calif. are often distinguished as Sierra White Fir, *A. lowiana* (Gordon) A. Murry. They have needles less whitened above, the low needles with tips weakly notched (use lens).

**SILVER FIR** *Abies amabilis* Dougl. ex J. Forbes

**PL. 7**

A coastal tree, ranging from extreme se. Alaska to nw. Calif. Needles not in flat sprays except as seen from beneath. Rather with bases *J-curved*, many needles tend to grow upward and become massed on the tops of twigs and branchlets, *hiding* them from above. Individual needles  $\frac{1}{2}$ –1 in. long, *flat*, *very dark green above*, silvery white beneath, and notch-tipped (use lens). Twigs hairy or not; buds resin-covered. Cones purplish, 3½–6 in. long. Trunk bark smooth, gray, fissured. Height 75–100 (245) ft.; diameter 2–4 ft. Coastal fog belt and high rainfall areas; mountain slopes at 2000–6000 ft. elevations. **SIMILAR SPECIES:** Within the range of Silver Fir, only (1) Grand Fir and (2) Western Hemlock (Pl. 8) also have flat needles green above and whitened below. Both of those species have needles in flat sprays and twigs easily visible from above. **REMARKS:** A beautiful tree, but shallow rooted and subject to windthrow. It is capable of growing in deep shade, unlike most other firs. A few specimens become 500 years old. Blue and





spruce grouse as well as Clark's nutcracker and various squirrels are reported to eat the seeds. Sometimes misnamed "larch" in the timber trade. There are nice stands of Silver Fir near the high end of the road on Mt. Baker, Wash. Sometimes named Pacific Silver Fir.

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**NOBLE FIR** *Abies procera* Rehd.

**PL. 7**

This tall fir of the Pacific Northwest has slender blue-green needles (under  $\frac{1}{16}$  in. wide), not in flat sprays but mostly with *J-curved* bases to become massed on twig and branchlet tops. Needles mostly *short*,  $\frac{1}{2}$ –1 in. long, blunt, marked *above and below* by *double* lines of white (use lens on fresh needles). Low branches bear flat needles that do not twirl between the fingers; needles on high (cone-bearing) branches mostly 4-sided. Twigs sometimes slightly hairy; buds mostly *not* resin-covered. Cones 4–7 in. long with long-pointed bracts extending beyond the scales and *folded downward* at right angles so as to nearly hide the scales. Often cone scales and angled bracts can be found in piles beneath the trees where squirrels have left them. Trunk purplish gray to red-brown, becoming much fissured and scaly with age. Height 150–200 (275) ft.; diameter 3–5 (9) ft. Mountain slopes at 1500–8000 ft., mainly Cascades south to nw. Calif. **SIMILAR SPECIES:** Three other firs have needles whitened on all surfaces. (1) White Fir has longer, wider, and flatter needles in more or less flat sprays with a U-curved pattern. (2) Subalpine Fir has needles longer with a single white stripe above, and buds resinous. (3) Red Fir has 4-sided (twirlable) needles. All of these species have cone bracts hidden between the scales. **REMARKS:** Noble Fir trees in dense stands often grow with few low branches. They may live to be 600–700 years old. The timber has the highest value of any fir. It is used for exterior siding and for house interiors including sash, moldings, doors, and floors.

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**RED FIR** *Abies magnifica* A. Murr.

**PL. 7**

A handsome fir mainly of the Sierra Nevada and s. Cascades. Needles  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. long,  $\pm$  4-sided, and *can* be twirled between the fingers. They are whitened on all surfaces, blunt tipped and *ridged* above. Most are *J-curved* at the base and massed on the tops of the twigs and branchlets. Twigs often hairy, with buds resin covered. Cones 6–8 in. long, purplish brown, with the bracts *hidden* between the scales. At high elevations the tree top is very narrow, steeplelike. Trunk bark deeply furrowed and reddish brown. Cones 6–8 in. long with bracts hidden between the scales. Height 80–120 (175) ft.; diameter 2–4 (8) ft. Areas of heavy snow at 5000–9000 ft. elevations. **SIMILAR SPECIES:** See Noble





**Fir. REMARKS:** Red firs 200 years old are not uncommon. Sooty grouse and pine grosbeaks are among the consumers of seeds. Shasta Red Fir (var. *shastensis* Lemm.), with pointed visible cone bracts, occurs from Lassen Peak, Calif., into sw. Ore. It is generally considered to be a hybrid with Noble Fir.

#### SUBALPINE FIR *Abies lasiocarpa* (Hook.) Nutt.

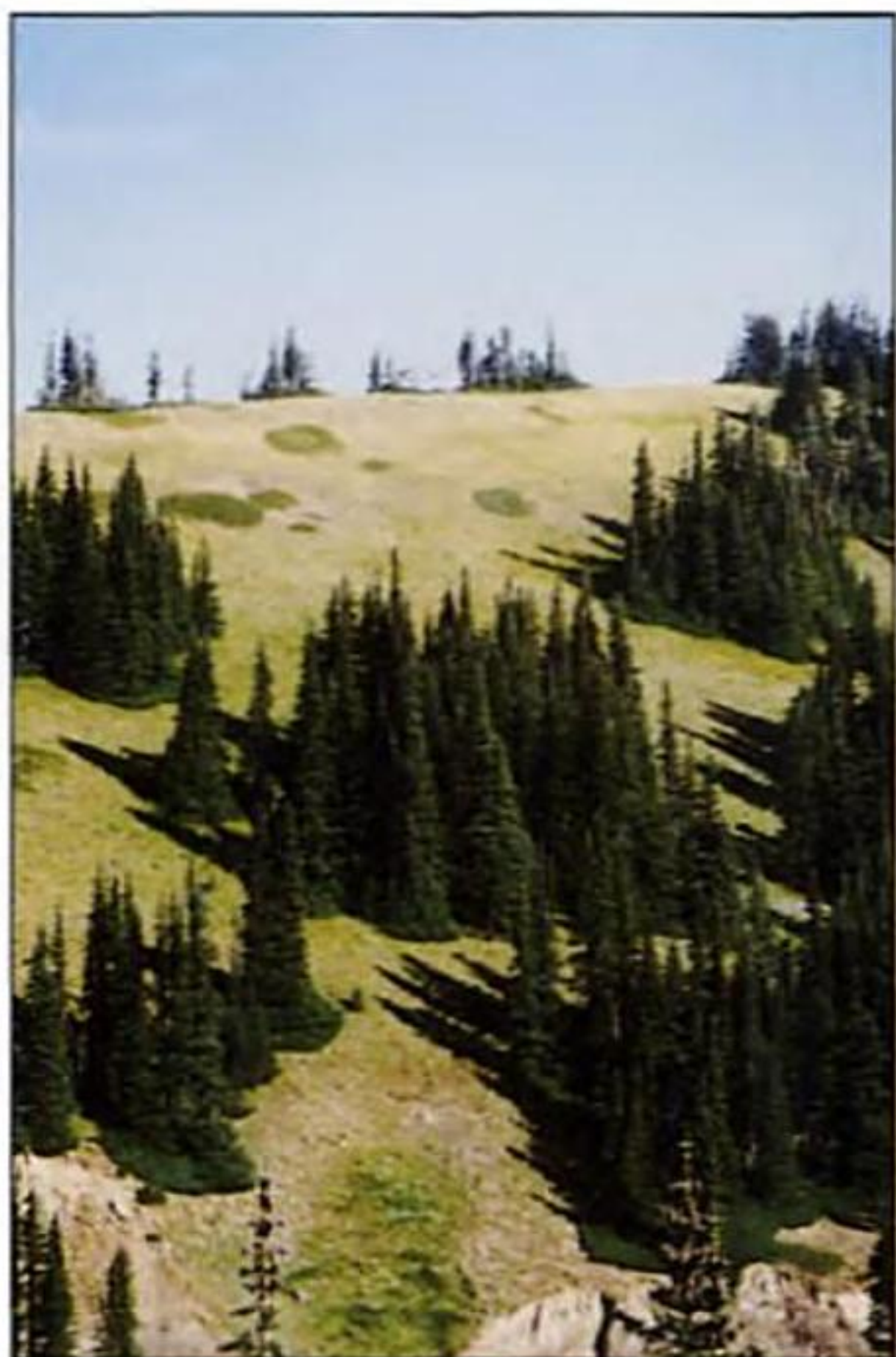
**PL. 7**

A tree of high elevations on coastal mountains from sw. Yukon to n. Calif., often at timberline and sometimes shrublike in exposed situations. A narrow *steeple-shaped* crown, though sometimes also seen in other firs (and spruces), is typical of this species. Needles *flat*,  $\frac{3}{4}$ –1  $\frac{1}{2}$  in. long, with bases *J-shaped* so that they are mostly erect and *bunched* on the upper sides of twigs and branchlets. Needles whitened *above and below*, either ridged or grooved with a single undivided white stripe *above* (use lens on fresh needles). Needle tips rounded or sometimes notched. Twigs sometimes slightly hairy; buds resin-covered. Cones purple and 2  $\frac{1}{2}$ –4 in. long, with bracts hidden between the scales. Trunk bark grayish-white, smooth, with resin blisters when young. Height 20–100 (140) ft.; diameter 1–2 (7) ft. Rocky soils. Trees of the Rocky Mountains from e. Yukon to s. N.M. have isosceles-shaped basal bud scales, red (rather than tan) fresh leaf scars, and chemical differences. They have been differentiated as *A. bifolia* A. Murray. Hybrids occur at interior locations. **SIMILAR SPECIES:** See (1) Noble Fir. Where they occur in the same habitat, (2) Engelmann and (3) White spruces (Pl. 6) often may be distinguished at a distance by the brown cones clustered near the tree top, while (3) Mountain Hemlock (Pl. 8) usually has a drooping leader shoot. **REMARKS:** Trees may reproduce vegetatively by layering, where low branches





*Subalpine Fir*



touch the soil and take root. Formerly called Alpine Fir, but only tundra plants found above timberline are now regarded as "alpine." Trees may reach 250 years of age. Mountain sheep and deer browse the twigs.

#### **BRISTLECONE FIR** *Abies bracteata* (D. Don) Poiteau **PL. 7**

Rare in the wild and native only in the Santa Lucia Mts. of Monterey and nw. San Luis Obispo counties, Calif. Needles *wide* (to  $\frac{1}{8}$  in.), stiff, *spiny-tipped*, shiny, *dark green above*, white-striped beneath, and  $1\frac{3}{4}$ – $2\frac{1}{2}$  in. long. Foliage in flat sprays on the low branches, but higher on the tree may be somewhat mixed. Twigs hairless, *drooping*; buds  $\frac{1}{2}$ –1 in. long, *pointed*, scaly, and *not* resinous. Cones are purplish and  $2\frac{1}{2}$ –4 in. long, with bracts *bristle-pointed* and extending  $\frac{1}{4}$ – $1\frac{3}{4}$  in. beyond the scales. Trunk brown and thin, usually with branches to the ground. Tree crown narrow and sharp, steeplelike. Canyon bottoms and slopes, mostly at 2000–5000 ft. elevations. **SIMILAR SPECIES:** No other fir has such wide and decidedly prickly needles or pointed buds. California Torreya (Pl. 8) also has flat, rigid, pointed needles that are white-striped beneath. They are not truly prickly, though, and the needle bases are slender, extending along the twigs.



A species of e. Canada and ne. U.S. and the only fir that extends westward across the prairie provinces to ne. and cen. Alta. Needles flat, *dark green* above, white-striped below, blunt,  $\frac{3}{8}$ –1 in. long and the lower ones in *flat* sprays. Twigs *hairless*; buds resin-covered. Cones purplish to green and 1–3 in. long. Bark gray and rather smooth with resin blisters. Height 40–60 (75) ft.; diameter 1–2 (3) ft. Moist soils, low elevations. **SIMILAR SPECIES:** Only in w.-cen. Alta. is there a chance of overlap with Subalpine Fir. That species, however, mostly occurs at high elevations and is narrowly steeple-shaped, with needles whitened above and the bases J-shaped. **REMARKS:** An important pulpwood species occasionally reaching 200 years of age. Canada balsam, obtained from the bark blisters, has been used by woodsmen as a wound plaster and as chewing gum. Before the invention of modern materials, it was employed in cementing lenses and mounting specimens on microscope slides. Resinous knots have been used as torches. Seeds eaten by ruffed, spruce, and sharptail grouse; twigs browsed by snowshoe hares, whitetail deer, and moose; inner bark gnawed by porcupines.

## OTHER CONIFERS WITH SINGLE FLAT NEEDLES (PLATE 8)

Though most are not closely related to each other, these trees tend to be evergreen, with flat needles in flat sprays and with brown, woody, pendent cones. Yet Baldcypress is non-evergreen, California Torrey and Pacific Yew have fleshy fruits, and Mountain Hemlock needles spread in all directions. Fresh needles of the first five species are white-banded beneath. The first six species have needles on thin, almost hairlike stalks.

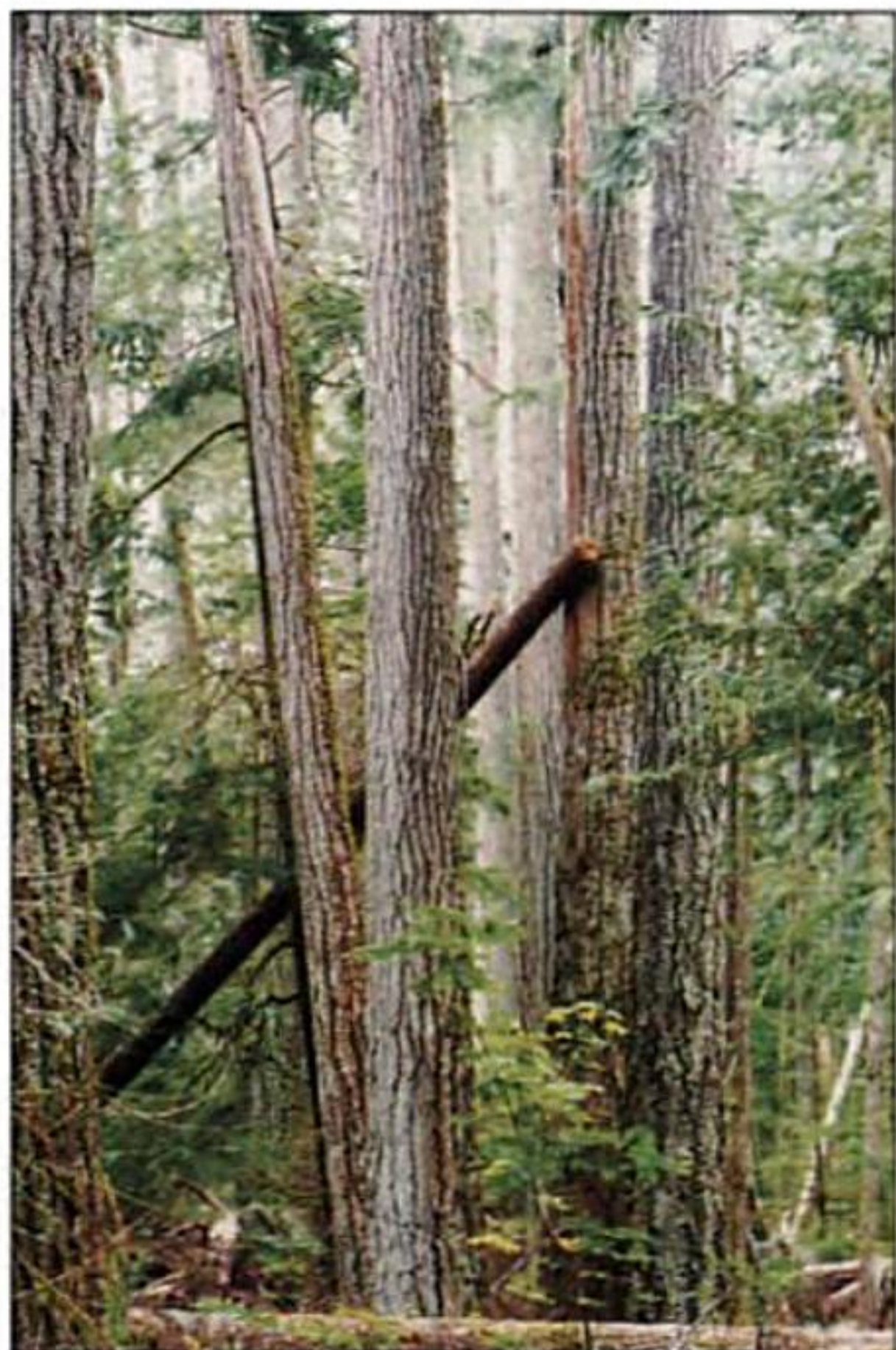




*Pseudotsuga menziesii* (Mirb.) Franco

A widely distributed western tree with needles  $\frac{3}{4}$ – $1\frac{1}{2}$  in. long, blunt, white-striped beneath, and *thin-stalked*. When needles fall or are plucked, they leave rather smooth *circular* leaf scars on the twigs as in true firs (Pl. 7). Twigs mostly hairless and *drooping*; buds *sharp*, hairless, reddish. Mature cones, usually common beneath even medium-size trees, are brown, woody, pendent, thin-scaled, and with peculiar and obvious *3-pointed bracts* that extend well beyond the cone scales. Cones are  $1\frac{1}{2}$ – $2\frac{3}{4}$  (4) in. long, coastal populations having shorter cones. Trunk bark dark, thick, and furrowed. Height 80–100 (300) ft.; diameter 2–5 (14) ft. Moist but well-drained soils from sea level in sw. B.C. to about 9500 ft. in the s. Rockies. Occurs locally south to cen. Mexico.

**SIMILAR SPECIES:** The unique cone bracts easily separate the Douglas-firs from other conifers. (1) Big-cone Douglas-fir (cones 4–7 in.) is known only from the coastal and central mountains of sw. Calif., mostly outside the range of Common Douglas-fir. In the rare absence of cones, the stalked needles and pointed buds distinguish both species from (2) true firs (Pl. 7). Of the several other conifers with needles stalked, (3) hemlocks have short needles, weak woody needle-pegs, and small cones without evident bracts, (4) California *Torreya* has stiff, spicy-scented foliage, and olive-like fruits, while (5) American Yew has green twigs, needles green on both sides, and fruits red and fleshy. (6) On the northwest coast, see Sitka Spruce (Pl. 6). **REMARKS:** The nation's most important timber species and a top producer



*Common Douglas-fir*





of plywood veneer. A very popular Christmas tree. Archibald Menzies, a Scottish medical doctor, discovered this tree in 1791 but it became better known after it was later collected by David Douglas, another early Scottish botanical explorer. Its scientific and common names honor both scientists. The stalked needles and brown pendent cones of Douglas-firs are not like those of true firs. Since hemlocks do

have stalked flat needles, the false-hemlock meaning of *Pseudotsuga* may be more suitable than that implied by the Douglas-fir name. Coastal and Rocky Mt. populations are recognized as varieties of the species, the inland form being less tall and with smaller cones and more blue-green foliage. A fast-growing invader of forest openings. Seedlings require some shade at first but later grow best in open sunlight. Capable of surviving both drought and forest fires, Douglas-firs more than 1000 years old have been found. Red squirrels, chipmunks, deer mice, and birds eat the seeds. Deer browse the twigs, and black bears sometimes strip the bark to consume the inner growing layer. Old-growth stands, as at Cathedral Grove Provincial Park on Vancouver I., B.C., are most impressive.

## BIGCONE DOUGLAS-FIR

NOT SHOWN

*Pseudotsuga macrocarpa* (Vasey) Mayr

Found in mountains of sw. Calif. from Kern and Santa Barbara counties south. Distinguished from the Common Douglas-fir mainly by cones 4–7 in. long with bracts extending conspicuously beyond the cone scales. Needles  $\pm$  pointed. Forests, canyons, and slopes at 1500–8000 ft. elevations. Height 40–50 (85) ft.; diameter 1–3 (4) ft.

## WESTERN HEMLOCK *Tsuga heterophylla* (Raf.) Sarg. PL. 8

An attractive tree of the Pacific slope and n. Rockies. Topmost leader shoot usually 1–3 ft. long with a characteristic *droop*. Needles  $\frac{1}{4}$ – $\frac{3}{4}$  in. long, of *different* lengths, blunt, dark green above, white-striped below, with thin *stalks* attached to *weak* pegs. If the leaves are plucked, these pegs tend to be removed with the needles. Where branches die naturally, however, it is evident that the twigs are roughened by *slender* needle pegs. Needles are in flat





*Bark of Western Hemlock*



sprays. Twigs hanging, usually fine-hairy. Buds globular, hairless. Cones delicate, only  $\frac{3}{4}$ –1 in. long, thin-scaled, pendent. Trunk brown to gray with scaly ridges. Height 75–120 (150) ft.; diameter 1–3 (4) ft. **SIMILAR SPECIES:** (1) Mountain Hemlock has thicker needles not in flat sprays and cones 1½–3 in. long. (2) Douglas-firs have stalked needles all of equal length and 3-pronged cone bracts. (3) Grand Fir and other true firs (Pl. 7) have smooth twigs with circular leaf scars and needles not stalked. (4) California Torrey and (5) Pacific Yew have fleshy fruits and needle bases which follow along the twigs. (6) Spruces (Pl. 6) have stout woody needle-base pegs. Leader shoots that lean also occur in Western Redcedar, Alaska-cedar, and Port Orford-cedar (Pl. 9), but those trees have scalelike leaves and their leaders are usually short. **REMARKS:** Wood is superior to that of Eastern and other hemlocks and is used in building construction as well as for paper pulp. Because hemlocks soon drop their needles, they do not make good Christmas trees. Bark was once extensively used in tanning leather. It is reported that Native Americans used the inner bark as food. They collected it in the spring, ground it into pulp, and baked it into cakes that were kept until needed in winter. Trees browsed somewhat by deer and elk. Hemlocks thrive on shaded sites to a greater extent than most other conifers. Though more



slow-growing, they may eventually overtop and dominate other species. They may rarely live to be 500 years of age. Beautiful large specimens are common in Olympic Nat'l. Park, Wash.

## MOUNTAIN HEMLOCK

*Tsuga mertensiana* (Bong.) Carr.

PL. 8

Distributed much like Western Hemlock but more alpine. Unlike the other members of this group, this species has needles *not* in flat sprays but spreading in all directions from the branchlets and forming starlike clusters on the twigs. Needles  $\frac{1}{4}$ – $\frac{3}{4}$  in. long, tend to be *thick*, somewhat rounded in cross section, thin-stalked and whitened on *all* surfaces, appearing blue-green. Topmost leader shoot usually *droops*, 1–3 ft. long. Cones narrow, 1½–2 (3) in. long. Height 30–100 (150) ft.; diameter 1–3 (6) ft. Often growing at timberline but best developed at sheltered locations in mountainous areas of heavy snowfall. **SIMILAR SPECIES:** See (1) Western Hemlock. (2) Subalpine Fir (Pl. 7) has its leader shoot erect and needles not stalked. **REMARKS:** The narrow crown of young Mountain Hemlocks and many high-elevation tree species is believed to be an adaptation to shed snow and thus avoid breakage. Like some other species, reproduction also may occur by vegetative means when the lower branches become rooted and eventually



*Bark of Mountain Hemlock*





## Mountain Hemlock

grow into separate trees. Fine stands of Mountain Hemlocks can be seen at Crater Lake Nat'l. Park, Ore.



## CALIFORNIA TORREYA *Torreya californica* Torr.

PL. 8

With relatives occupying comparatively small areas in China, Japan, and Florida, this species is a survivor of a group that in earlier geologic times occurred in what are now arctic regions. Needles are stalked, stiff, *spine-tipped*, flat, white-striped beneath, and 1–3 in. long. They have a strong *odor* when crushed and bases that *extend* along the twig. Stump sprouts occur. Sexes are separate. Fruits fleshy but woody, *olivelike*, green with purple lines, *closed* at the end, one-seeded, and 1–1½ in. long. Height 15–70 (100) ft.; diameter 1–2 (4) ft. Canyons and streamsides to 4000 ft. elevation, cen. Calif. **SIMILAR SPECIES:** (1) Pacific Yew has needles shorter, softer, and not odoriferous. Also, its fruits are bright red and open at the end. (2) Redwood, which similarly sprouts readily, has flexible, nonstalked needles with no marked odor. (3) Bristlecone







*Bark of Pacific Yew*

Fir (Pl. 7) has dark, spiny-tipped needles that have circular attachments to the twig. **REMARKS:** The wood has some local value in furniture making and is durable as fence posts. A member of the yew family.

**PACIFIC YEW** *Taxus brevifolia* Nutt.

**PL. 8**

A shrubby to medium-size tree of the Pacific slope and n. Rockies. Needles  $\frac{1}{2}$ –1 in. long, thin-stalked, short-pointed, flexible, and green on both sides. Needle bases *follow* along the twigs. Twigs *green*; buds brown, hairless, pointed. On female trees, fruits are  $\frac{3}{8}$ – $\frac{1}{2}$  in. in diameter, soft, berrylike, *bright red* when ripe, and with an *open* end revealing the single dark seed. Trunk twisted, fluted, with bark thin and peeling. Stumps can produce sprouts. Height 25–50 (75) ft.; diameter 1–2 (4) ft. A shade-loving species occurring locally within coniferous and other forests.

**SIMILAR SPECIES:** None when the unique fruits are present. (1) California Torreya and (2) Redwood also have needle bases that extend along the twigs, but both have needles white-striped beneath. Those of the former are longer and stiff with pointed tips; the latter species has more fernlike foliage with needles not stalked. **REMARKS:** The drug Taxol, first discovered in the bark of this plant, has proven useful in the treatment of some cancers.





Mature foliage is poisonous to most livestock. The reddish wood is reported to take a high polish. English and Japanese yews are much used in landscape plantings.

**REDWOOD** *Sequoia sempervirens* (D. Don) Endl. **PL. 8**

Probably the most impressive tree in N. America. The California groves of straight and immensely tall specimens are world renowned. Large specimens are recognizable by size and beauty. For smaller plants, the needles of low branches are  $\frac{1}{2}$ – $1\frac{1}{4}$  in. long and in *flat* sprays. They are flexible, white-banded beneath, *not* stalked, and with bases *following* along the twig. On high branches and at some twig ends, needles are  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, slender, sharp, *awl-shaped*, and *not* in flat sprays. Twigs *green*; buds scaly, hairless, blunt. Cones woody, brown,  $\frac{3}{4}$ –1 in. long, and with thick scales. Trunk often swollen and buttressed at the base; bark red-brown, furrowed, fibrous, and often a foot thick. Sprouts frequent at trunk bases and may occur elsewhere on the trunk, especially after damage by forest fire. Height 150–325 (365) ft.; diameter 10–18 (21) ft. Bottomlands and moist soils in the narrow *coastal* fog belt from sw. Ore. to cen. Calif. **SIMILAR SPECIES:** The related (1) Giant Sequoia (Pl. 10) grows locally above 5000 ft. in the Sierra. All of its needles are awl-shaped, and its buds lack scales. (2) Pacific Yew and the other coastal species of this plate have stalked needles. In landscaped areas, see also (3) Dawn-redwood (under Baldcypress, next). **REMARKS:** Magnificent trees, the world's tallest, providing some of the continent's most scenic and memorable vistas. No one should miss seeing them at their best in Redwoods Nat'l. Park and along the Redwoods Highway, both in n. Calif. Redwoods may live to be over 2000 years old. Despite their mas-



sive size and age, it is impressive to realize that they spring from a seed weighing only  $\frac{1}{6000}$  of an ounce. The wood is termite resistant, straight-grained, usually free of knots, and highly valuable. Trunk swellings known as burls yield fine table tops and other polished articles.

Intensive lumbering has depleted Redwood stands over much of their former range. Reproduction occurs rapidly after cutting, however, originating even within 2 or 3 weeks as stump and root sprouts. Though depleted, fine virgin stands remain under protection. Fossil remains indicate that Redwoods ranged over most of the northern hemisphere in earlier geologic times. The genus was named after a prominent Cherokee chief whose name is often spelled Sequoyah.

**BALDCYPRESS** *Taxodium distichum* (L.) Richard **PL. 8**

A handsome non-evergreen tree of swamps in the southeast U.S. ranging west to cen. and s. Texas. Needles  $\frac{1}{4}$ – $\frac{7}{8}$  in. long, green on both sides, flat or sometimes rather 3-sided; arranged alternately along slender greenish twigs that do not droop markedly. Needles and most twigs *fall in winter*, leaving branchlets roughened by small, few-scaled buds. Leaf scars lacking; twig scars similar to leaf scars are present but without bundle scars. Bark brown, rather smooth but fibrous. Trunk base often *enlarged* and deeply ridged. When growing in water, *peculiar root growths* called "cypress knees" grow upward to and above the surface. Cones ball-shaped,  $\frac{3}{4}$ –1 in. across, with thick scales. Height 80–120 (140) ft.; diameter 3–4 (20) ft. Swamps and streambanks. **SIMILAR SPECIES:** (1) Larches, the only other non-evergreen conifers in the West, do not occur south of the Canadian prairie provinces and n. Rockies. They have needles in clusters and cones with thin scales. (2) Dawn-redwood (*Metasequoia glyptostroboides* Hu & Cheng.),





found in China in 1944 and regarded as a living fossil, is often seen in parks. It, too, is deciduous but the needles, buds, twigs, and cone scales are in opposing pairs. **REMARKS:** In the southeastern states, wading or boating into quiet, mature stands of Baldcypress gives one an impression of grandeur similar to that experienced amid the Redwood groves of California. Also a valuable lumber tree whose soft but durable wood is used for railroad ties, posts, and shingles. Grows on uplands even in northern states, if planted. Seeds eaten by cranes and some songbirds. Montezuma Baldcypress of Mexico is now considered of doubtful validity. True cypresses (Pl. 9) are evergreen and are in a different plant family.

## CONIFERS WITH SMALL SCALELIKE LEAVES: "CEDARS" AND CYPRESSES (PLATE 9)

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The "cedars" of this plate are magnificent tall trees of the Pacific Northwest. They form some of our most beautiful forests and serve as some of our most valuable timber species. No American conifer, however, is a true cedar, a fact indicated by the "cedar" name being hyphenated or otherwise linked to a prefix. For true cedars, see p. 124.

The species of this plate have twigs covered by scalelike, often aromatic, evergreen leaves mostly under  $\frac{1}{4}$  in. long. The tiny leaf-scales occur mostly in pairs that alternate at right angles (use lens). Often they have a small gland dot that may require 10x magnification to detect. Several species show white markings on fresh needles. Only rarely are small pointed needles also present.

Junipers (Pl. 10) also have foliage scalelike but they usually also have some awl-shaped leaves present. Since some juniper specimens may lack these pointed needles, however, it is best to locate fruits in order to distinguish between cypresses and junipers with certainty.

In contrast to the fleshy blue or reddish fruits of junipers, the cones of "cedars" and cypresses are woody, brown, and (except for Incense-cedar and Western Redcedar) nearly globular. In cypresses, old cones tend to remain on the trees.

In both groups, branchlets and their scaly leaves may be shed together after several years on the tree. Cypress twigs tend to be 4-angled.

Most of the several American cypress species tend to occur naturally over only relatively small areas in Ariz., Calif., and Ore. In identifying these cypresses, judgments based on locality may be helpful, but plantings beyond the native range are likely. Cypresses are often difficult to name. Final identification of some specimens may require expert opinion.





*Incense-cedar*

**INCENSE-CEDAR** *Calocedrus decurrens* (Torr.) Florin **PL. 9**

A large, handsome tree of the Sierra Nevada, coastal ranges, and Cascade Mts. north to Ore. An inverted cone in shape and usually perfectly erect. Foliage in *flat* sprays. The paired scalelike leaves are *longer* ( $\frac{1}{4}$ – $\frac{1}{2}$  in.) than those of other members of this group and are arranged along the twigs in slender *vase-shaped* whorls. The foliage is *neither* whitened nor gland-dotted but is smooth, *glossy*, and aromatic when crushed. It does *not* droop. Topmost leader shoot erect. Cones  $\frac{3}{4}$ –1 in. long, pendent, slender, with *six* scales, of which four are full-length. Wood is pale brown and aromatic. Mature trunk bark reddish brown, thick, furrowed. Height 60–80 (150) ft.; diameter 3–4 (7) ft. Moist to dry mountain slopes at 2000–8000 ft. elevation; also in Baja California Norte. **SIMILAR SPECIES:** Vase-shaped alternating pairs of elongated

leaf scales and smooth, slender, few-scaled cones are unique. **REMARKS:** Formerly assigned to the genus *Libocedrus*, the species is now regarded by botanists as sufficiently different from relatives in Chile, the South Pacific, and China to deserve a different name. Trees over 500 years old have been recorded. Wood durable and fragrant; used for fencing, shingles, cedar chests, and wooden pencils.







*Bark of Western Redcedar*



## WESTERN REDCEDAR

PL. 9

*Thuja plicata* D. Don ex Lambert

An important tree of the coastal Northwest and n. Rockies. Foliage in  $\pm$  flat sprays along the branches. Scaly leaves  $\frac{1}{16}$ – $\frac{1}{8}$  in. long, paired, flat, and *broadly whitened* beneath in a so-called butterfly pattern (use lens). The tiny leaves mostly without gland dots and tips *pressed against* the scale-covered twigs. Foliage *droops*, forming inverted Us or Vs along the branches. Leader shoot short, may droop. Cones  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, *upright*, light brown, not globular, and with 8–12 smooth pointed scales. Wood light brown. Trunk bark shreddy, reddish brown, with *vertical grooves*; trunks sometimes with buttressed bases. Height 60–130 (180) ft.; diameter 1–2 (20) ft. Mostly bottomlands and moist sites, sea level to 6000 ft. elevation. **SIMILAR SPECIES:** (1) Incense-cedar also has wood brownish and cones not ball-shaped. Its foliage does not droop, however, and its leaf scales are slender, not whitened, and form vase-shaped whorls. In addition, its cones are pendent. (2) Alaska-cedar has leaf sprays tending to hang vertically, the leaf scales pointed outward and not whitened beneath (use lens). It also has bark flaky and not furrowed plus cones globular. (3) Port Orford-cedar has ball-shaped cones, leafy twigs more slender, and



leaf scales with thin white lines on the undersides (use lens on fresh needles). (4) Drooping leader shoots of hemlocks (Pl. 8) are longer, often to 1 ft. or more in length. **REMARKS:** An important decay-resistant and durable timber tree used for fences, shingles, barrels, and furniture. Native Americans used the trunks for totems and for war canoes that could hold up to 40 people. They also made the trunks into planks for constructing lodges and employed the fibrous inner bark in making ropes, fish nets, blankets, baskets, and roof thatch. Wood cut from stumps or logs makes excellent kindling even in wet weather. Western Redcedar is shade-tolerant and lives to be 450 years of age or older. Deer browse the foliage. Frequently planted in landscaping; a “golden-foliage” variety is in cultivation. The generic name is pronounced, and occasionally improperly written, *Thuja*. Western Redcedar and Eastern Redcedar (Pl. 10), despite similar common names, are in different genera. An older name, Canoe-cedar, might well be resurrected.

## ALASKA-CEDAR

PL. 9

*Chamaecyparis nootkatensis* (D. Don) Spach.

Also thriving on the cold and foggy northern Pacific slope, this “cedar”, too, has leaves in *flat* sprays that *droop* strongly, often



*Bark of Alaska-cedar*





hanging vertically. Scalelike leaves  $\frac{1}{16}$ – $\frac{1}{8}$  in. long, without distinct glands, and with *no whitish markings* (use lens on fresh needles). Especially on vigorous shoots, its leaves have pointed scale-tips *spreading outward* (use lens). Leader short, may lean or droop. Cones *ball-shaped*,  $\frac{3}{8}$ – $\frac{1}{2}$  in. in diameter, dark, the centers of the 4–6 scales generally with prominent  $\frac{1}{16}$ – $\frac{1}{8}$ -in. points. Wood durable, yellow with resinous scent. Trunk bark gray or reddish and somewhat *flaking*. Trunk base often swollen or buttressed. Height 50–100 (175) ft.; diameter 1–3 (10) ft. Moist soils. Also local inland in se. B.C. and cen. Ore. **SIMILAR SPECIES:** See (1) Western Redcedar and (2) Port Orford-cedar. **REMARKS:** Also known as Yellow-cedar or Yellow-cypress. It was discovered in 1793 at Nootka, Vancouver I., B.C., by Archibald Menzies. Somewhat tolerant of shaded conditions for germination and growth. Alaska-cedar can readily be seen at middle elevations on the Hurricane Ridge road in Olympic Nat'l. Park, Wash.

## PORT ORFORD-CEDAR

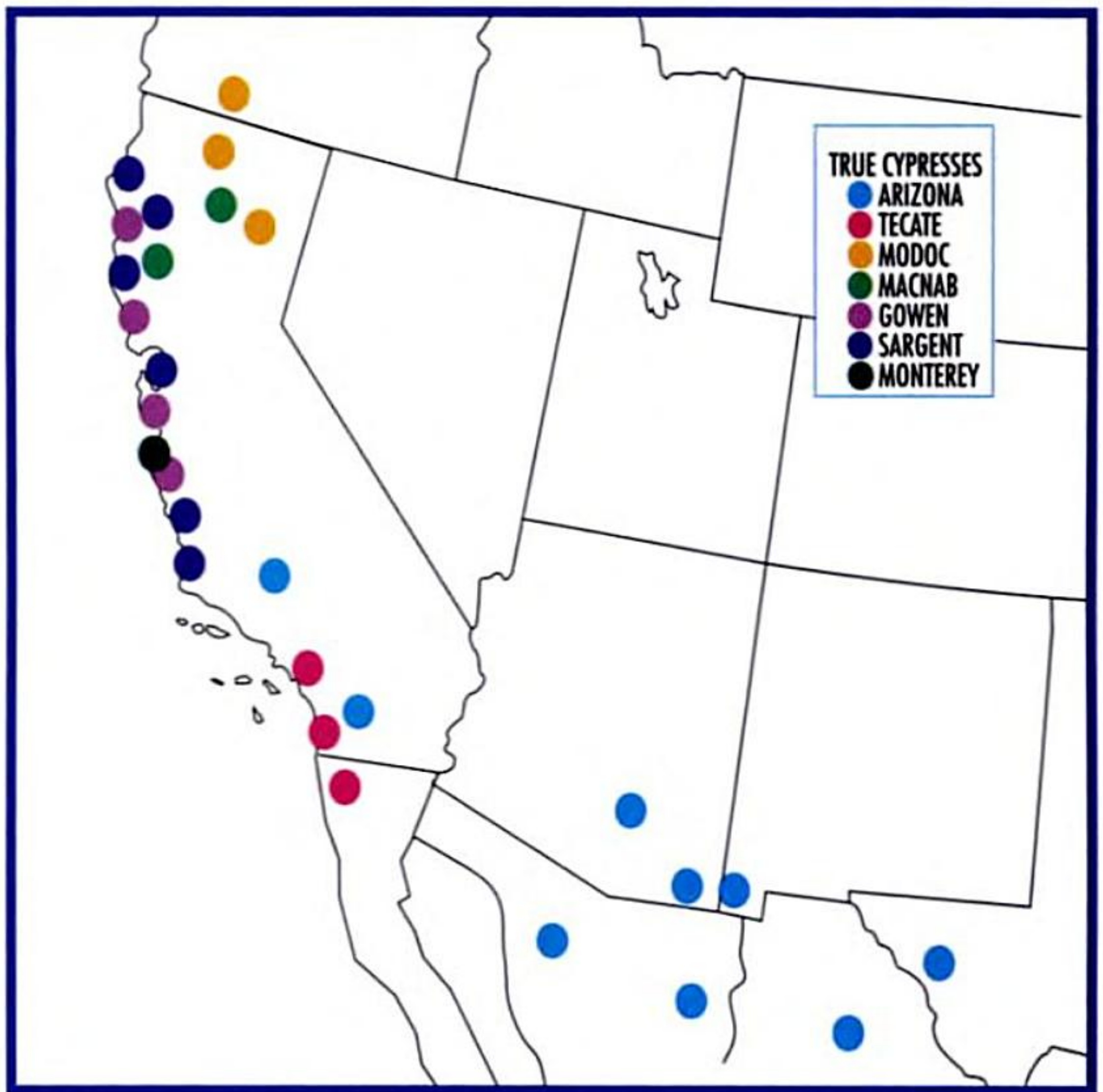
PL. 9

*Chamaecyparis lawsoniana* (A. Murr.) Parl.

This scaly-leaved tree with foliage in *flat* sprays is native to restricted areas in sw. Ore./nw. Calif. and on Mt. Shasta, n. Calif., but is also planted elsewhere. Leaves about  $\frac{1}{16}$  in. long on *narrow* scale-covered twigs; marked with *conspicuous glands* and thin, white *X-like* lines beneath. Leaf scales hug the twigs and do *not* point outward. Foliage does *not* droop conspicuously. Topmost leader may lean. Cones as in Alaska-cedar but  $\frac{1}{4}$ – $\frac{3}{8}$  in. in diameter, with 7–10 cone scales with or without tiny central points. Wood pale yellow. Trunk bark dark red-brown, ridged. Height 110–175 (200) ft.; diameter 1–3 (6) ft. Moist but well-drained soils. **SIMILAR SPECIES:** Related to Alaska-cedar and with similarly globular cones, but foliage more like Western Redcedar. (1) Alaska-cedar has branchlets and twigs drooping, leaf-scale points angled outward, scales not whitened, and cones larger with points centered on the scales. (2) Western Redcedar has somewhat wider scaly twigs with broad white markings beneath plus small, slender, upright cones. **REMARKS:** This is the tallest member of the cypress family. Lumber is in demand for boats, building construction, fence posts, and







matchwood. A large number of ornamental varieties are cultivated in Europe and around the world. Often called Lawson-cedar or Lawson-cypress. Charles Lawson was an early 19th-century Scottish nurseryman and botanist.

## TRUE CYPRESSES

A number of different trees around the world, including the Bald-cypress (Pl. 8), go by the name cypress. Only those of the genus *Cupressus*, however, are true cypresses. They look much like junipers (Pl. 10) since both groups have tiny, twig-hugging leaves that mostly are *not* in flat sprays. Tree-size specimens of true cypresses, however, tend to have *only* scalelike leaves and produce







brown, *woody*, mostly spherical cones with flat-topped scales. Cones of true cypresses take two years to reach maturity and tend to remain on the tree for some months thereafter. Furthermore, both sexes are present on the same tree. In contrast, although junipers may display *both* scalelike and awl-shaped leaves, they have *fleshy* fruits, found mainly on separate female trees. Juniper berries fall when mature (in 1–2 years) and disappear when eaten by wildlife. A tree with only scalelike needles and with brown woody cones, therefore, is a true cypress. Except for MacNab Cypress, none has needles in flat sprays.

ARIZONA CYPRESS *Cupressus arizonica* Greene

PL. 9

This, the most wide-ranging of our true cypresses, occurs near the border with Mexico from sw. Calif. and cen. Ariz. to w. Texas (Big Bend Nat'l. Park). Leaf scales *tiny*,  $\frac{1}{16}$  in. long, angled, somewhat *whitened* and mostly with a gland dot, rather pointed and closely *hugging* the twigs. The *blue-* or *pale green* needle-covered twigs are 4-sided, *slim*, and branched at *wide angles*. Branchlets often grayish. Cones woody, *ball-shaped*,  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. in diameter, with 6–8 short-pointed, red-brown or gray scales. Old cones often remain on the tree. Wood yellowish. Mature trunk bark gray to black, thin, occasionally in squarish plates, and sometimes red and smooth. Height 40–70 ft.; diameter 1–3 ft. Gravelly slopes and bottomlands; also n. Mexico. **SIMILAR SPECIES:** The trunk bark of (1) Alligator Juniper (Pl. 10) is thick and deep, and the segments are in more regular squares. In sw. Calif., see (2) Tecate Cypress.



**TECATE CYPRESS** *Cupressus guadalupensis* Wats. **NOT SHOWN**

A rare and local small tree with many of the characteristics of Arizona Cypress but with *smooth*, reddish brown bark *peeling* in patches and revealing orange and/or green underbark. Branchlets bright *red*. Height 20–30 ft.; diameter 1–2 ft. Cones  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. in diameter. Rocky slopes and canyons, 1500–5000 ft. elevation in Orange and San Diego counties, sw. Calif. Also in nw. Baja California Norte and on Guadalupe I., Mexico. Pronounced teh-KAH-tay.

**MODOC CYPRESS** *Cupressus bakeri* Jeps. **NOT SHOWN**

A scarce cypress of local, rather infertile sites in n. Calif. and sw. Ore. Leaves  $\frac{1}{16}$  in. long, *dark green*, each with an evident *gland dot*. Twigs 4-angled and slender. Cones  $\frac{3}{8}$ – $\frac{3}{4}$  in. in diameter with 6–8 *warty* scales. Seeds light brown. Bark grayish, rather smooth, often with thin curls. Height 30–80 ft.; diameter 1–2 ft. Dry inland slopes, mainly Siskiyou Mts. **SIMILAR SPECIES:** MacNab Cypress has prominent cone scale projections, foliage in flat sprays, trunk bark more furrowed. **REMARKS:** Milo Baker was a California botanist who discovered this species late in the last century. Often called Baker Cypress.

**MACNAB CYPRESS** *Cupressus macnabiana* A. Murr. **NOT SHOWN**

Found locally through the nw. foothills of the Sierra Nevada and the se. slopes of n. Calif. coastal ranges. Marked by glandular, dark green leaf scales mostly in *flat sprays* and by *prominent* projections of the cone scales. Cones  $\frac{1}{2}$ –1 in. in diameter, red- or gray-brown, with 6–8 scales, each with a  $\frac{1}{8}$ – $\frac{3}{16}$ -in.-long, *hornlike* cone scale protuberance. Trunk bark gray and furrowed. Height 20–30 (130) ft.; diameter 1–2 (3) ft. Dry rocky soils to 5500 ft. elevation. **SIMILAR SPECIES:** See Modoc Cypress. **REMARKS:** Used occasionally for fence posts. Named for James MacNab of the Edinburgh Botanic Garden, Scotland, who collected plants in North America in the early 1800s.

**GOWEN CYPRESS** *Cupressus goveniana* Gord. **NOT SHOWN**

An uncommon *coastal* species found from Mendocino Co. to Monterey. Often associated with Redwood forests. The dark green, *pointed* leaf scales are much like those of other cypresses, but, like those of Monterey Cypress, they *lack* a gland dot. Cones  $\frac{1}{2}$ – $\frac{3}{4}$  in. in diameter with 6–8 *warty* scales. Seeds brown to *black*. Bark gray, rough, furrowed. Height 15–25 (75) ft.; diameter 1–2





(3) ft. From sea level to 3000 ft. elevation. **SIMILAR SPECIES:** Monterey Cypress has leaf scales more obtuse and cones 1–1½ in. in diameter with 8–14 scales. **REMARKS:** Often shrubby. Named after Robert Gowen, a British botanist of the last century. Trees known as Mendocino and Santa Cruz cypresses are local varieties of this species.

**SARGENT CYPRESS** *Cupressus sargentii* Jeps. **NOT SHOWN**

Separated from Gowen Cypress by the usual *presence* of a leaf scale gland and cones ¾–1 in. in diameter. Seeds dark brown. Height 15–30 (50) ft.; diameter 1–2 (3) ft. Dry slopes of cen. and n. Calif. coastal ranges, to 3000 ft. elevation. **SIMILAR SPECIES:** (1) Gowen Cypress has smaller cones with black seeds. (2) Monterey Cypress has larger cones with more scales. Both lack leaf glands. **REMARKS:** Sometimes regarded as a variety of Gowen Cypress. Named to honor Charles Sprague Sargent, the founder of Harvard University's Arnold Arboretum and student of North American trees.

**MONTEREY CYPRESS** **NOT SHOWN**

*Cupressus macrocarpa* Hartw.

Differs from the previous two species in having cones 1–1½ in. in diameter with 8–14 scales. Scalelike leaves rather *blunt*, mostly *without* a gland dot. Seeds dark brown. Height 40–70 (80) ft.; diameter 1–3 (5) ft. Coast near Monterey, Calif. **REMARKS:** Much photographed, especially along the sea cliffs of Monterey Bay, where it thrives despite sea spray and onshore winds. Widely planted in Calif. and in temperate climates around the world.

**TREES WITH SCALELIKE AND/OR  
AWL-SHAPED LEAVES: JUNIPERS, GIANT  
SEQUOIA, TAMARISK, REDSHANK (PLATE 10)**

Junipers are small, slow-growing trees, most common in dry climates. The junipers of Pl. 10 are like the “cedars” and cypresses of Pl. 9 in having small (⅙–⅛-in.-long), scalelike leaves often marked with a gland dot. The junipers (also frequently called cedars) in addition, however, typically display small, sharp *needle-shaped* leaves ¼ (½) in. long. These are usually present on at least some of the quickly growing twigs. As in cypresses, the leaves and twigs of junipers fall together as they age.

In addition to the two types of leaves usually present, junipers can be recognized by their sometimes hard but basically fleshy fruits, which, berrylike, contain 1–12 seeds. Juniper berries are considered to be cones in which the relatively soft and thick





scales have fused. The fruits are blue when young, maturing to be either blue or reddish brown. They are more or less ball-shaped, mostly about  $\frac{1}{4}$  in. in diameter, and often covered with a powdery whitish bloom. Where the mature fruits are

blue to blue-black, they usually also are juicy and resinous. The mature red-brown fruits of other species tend to be more dry and fibrous. Where a specimen has only scalelike leaves, an effort should be made to find fruits to determine whether it is a cypress (Pl. 9). Since the sexes of junipers are mostly on separate plants, female trees may have to be located in order to secure fruits. In season, developing flowers may give a brownish or yellowish cast to male trees. Junipers, like cypresses, often are difficult to identify.

Native Americans and early pioneers ate the raw fruits of some junipers and also made them into a flour, perhaps cooked with other foods to make them more palatable. They used the dried shreddy bark of many species for beds and padding. The berries have been used to flavor gin.

Juniper berries often show a whitish "bloom." They are eaten and the seeds spread by many birds, including ruffed and sharp-tail grouse, wild turkeys, and Mearns quail. Mammals that consume the fruits include black bears, three species of deer, gray foxes, coyotes, various chipmunks and squirrels, armadillos, and opossums. Deer sometimes browse the twigs.

Junipers are slow to grow but have long lives. The wood is durable and usually aromatic. It is favored for fence posts and, where large trees are available, for "cedar" chests.





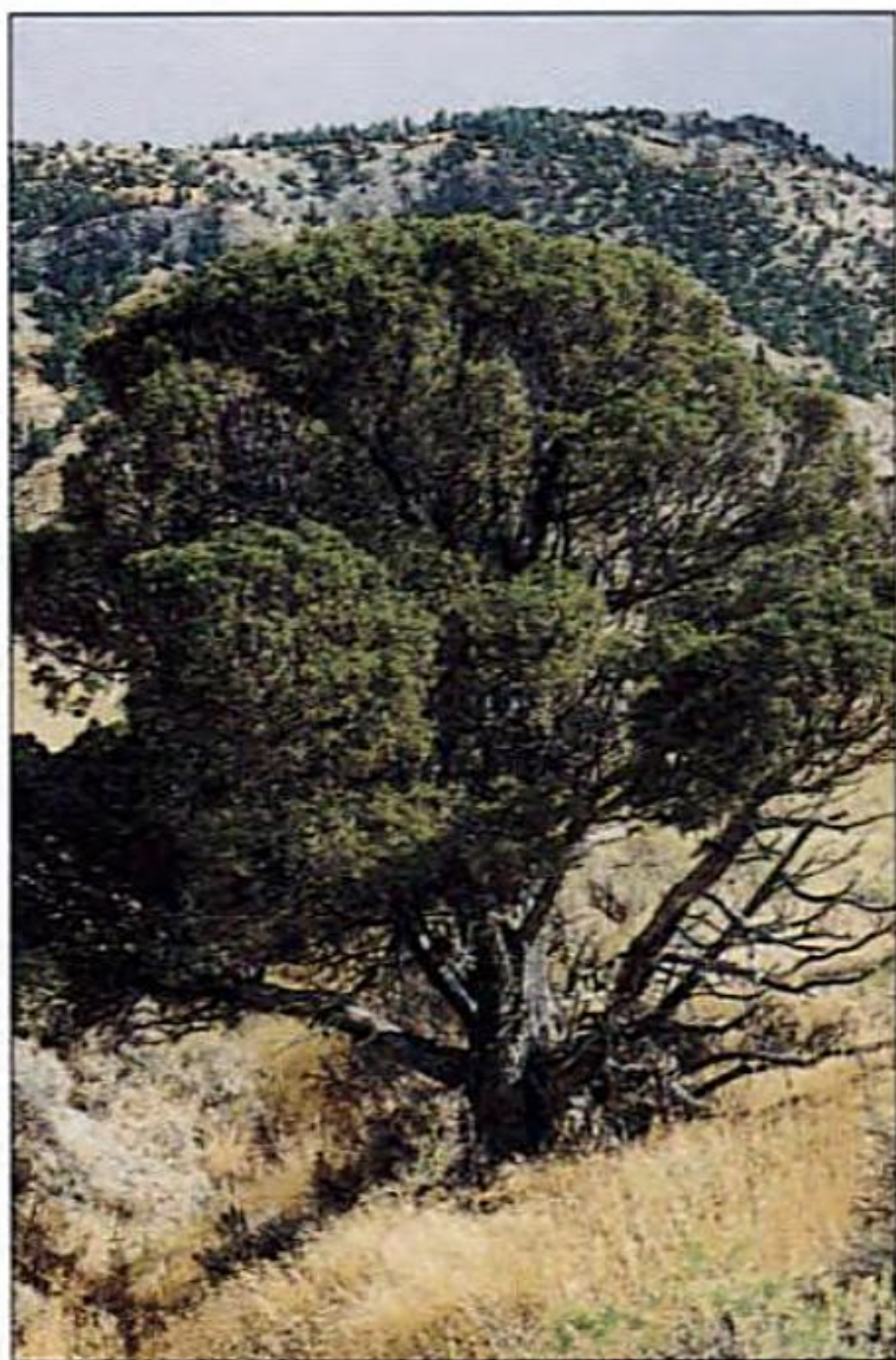
Giant Sequoia has only awl-shaped leaves, and the tamarisks have only scaly, juniperlike needles. The former is the world's largest tree in terms of total bulk; the latter group comprises imported species that are naturalized in southwestern states.

## ROCKY MOUNTAIN JUNIPER

PL. 10

*Juniperus scopulorum* Sarg.

The most wide-ranging of western junipers, with thin *threadlike* scaly twigs. Often tall and usually pointed-topped but sometimes shrubby. Twigs rather obviously slender, being only about  $\frac{1}{32}$  in. thick. They tend to be 4-sided and often *droop*. Leaves small, bluish- to *dark green* and somewhat long-pointed. Leaf scales mostly in pairs, alternating at right angles (use lens). A tiny gland pit usually present. Mature fruits  $\frac{1}{4}$  in. across, fruits bright *blue*, with 1–3 (usually 2) seeds. Trunk usually *single*, with bark red-brown and shreddy. Height 15–30 (40) ft.; 1–2 (9) ft. Dry slopes and canyons, 5000–8000 ft. elevations mainly in the Rocky Mts. and outlying ranges. **SIMILAR SPECIES:** Our other junipers have wider ( $\frac{1}{16}$  in.) scale-leaved twigs. Range overlap with (1) Western Juniper occurs only in the area where Idaho, Ore., and Wash. meet. Its foliage is gray-green with leaf scales blunt, and leaves are largely in 3-needle whorls rather than being paired, though the difference is not always easy to detect. (2) Oneseed Juniper, in the s. Rockies, usually has several trunks and only one seed per fruit. In the Great Basin, (3) Utah Juniper has blunt, yellow-green leaves without gland dots. (4) Alligator Juniper is a southwestern species with a deeply check-



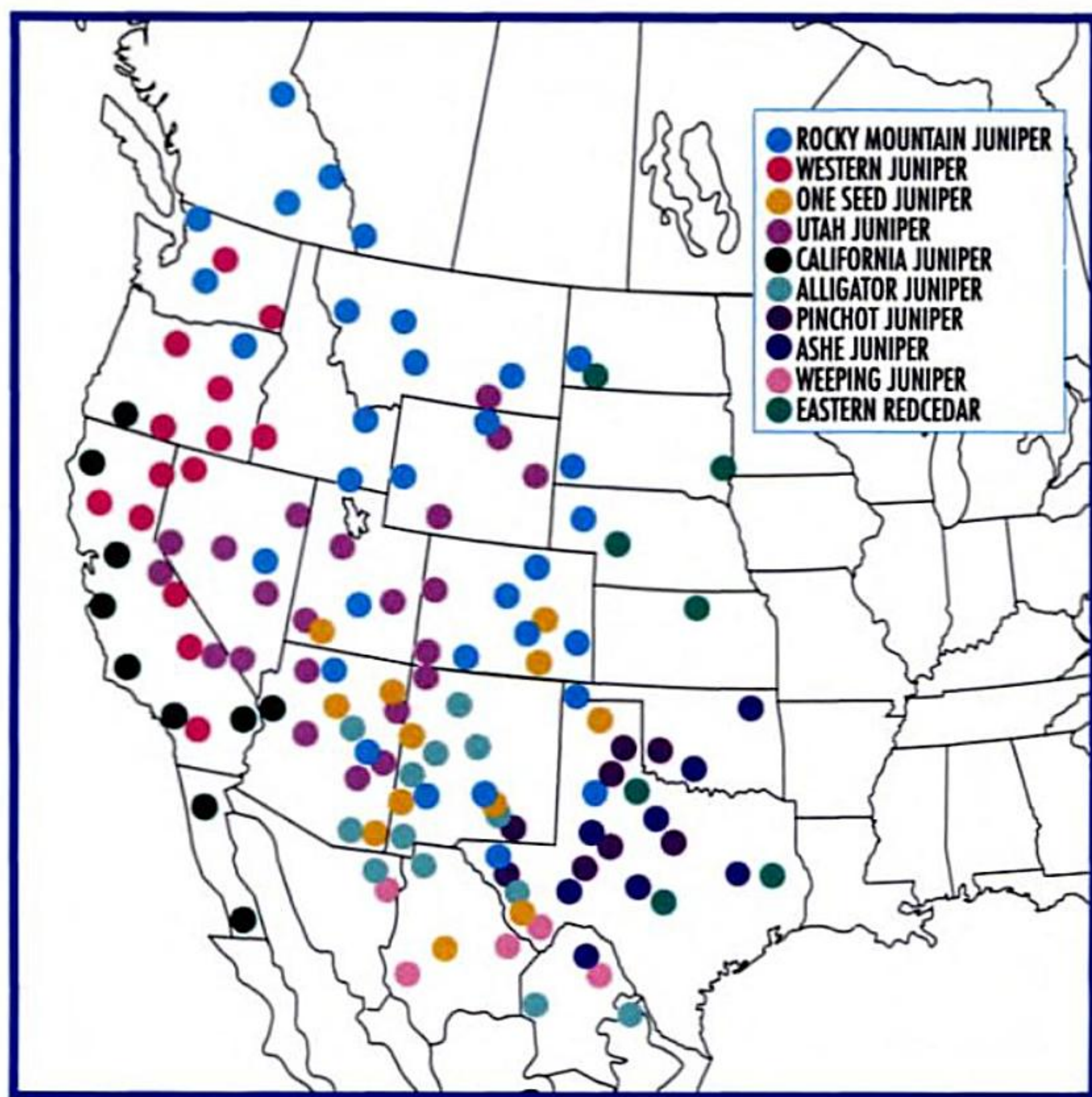
*Rocky Mountain Juniper*



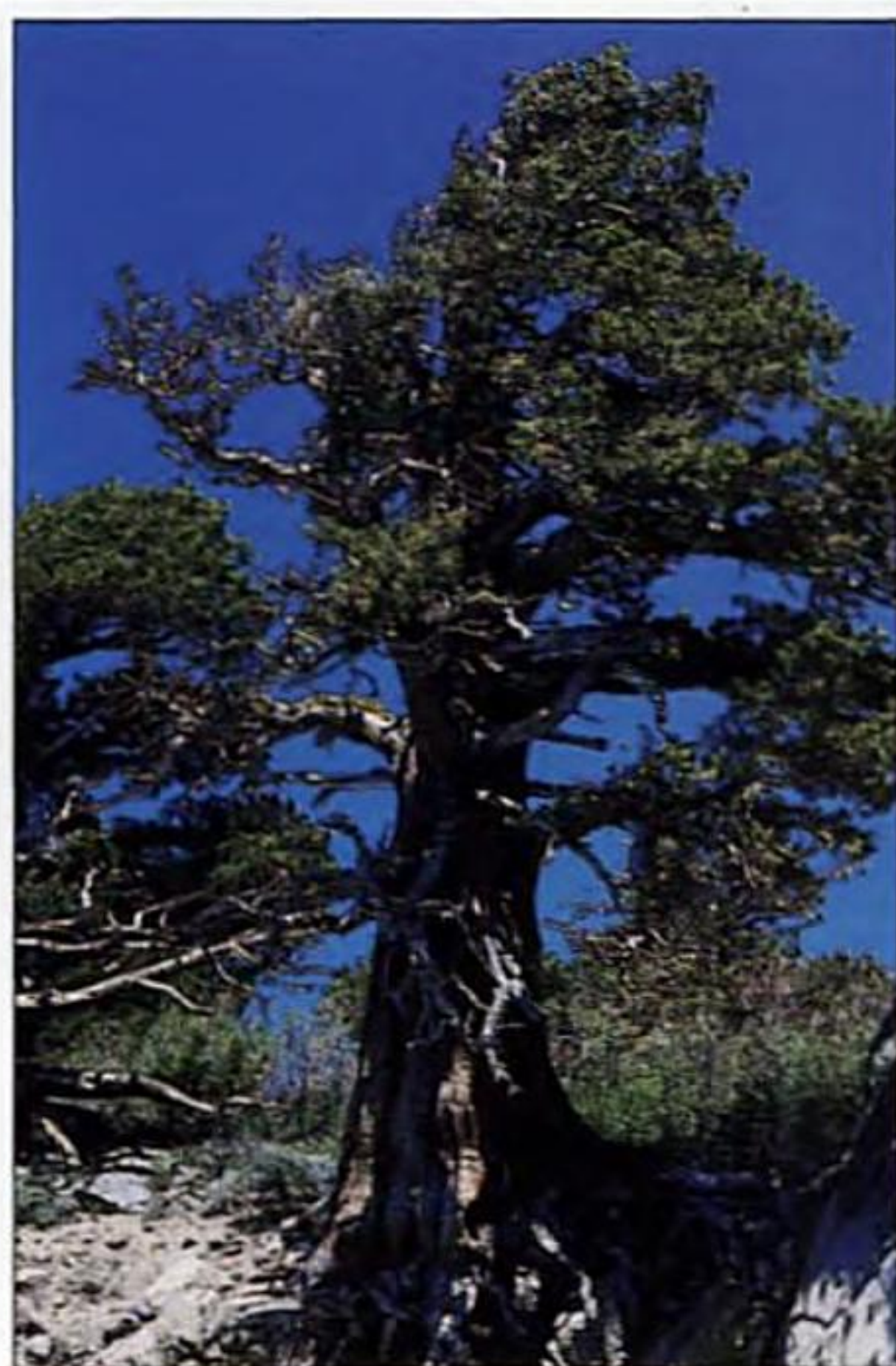
ered trunk. **REMARKS:** One specimen in Logan Canyon, Utah, is estimated to be 1500 years old, but a 200–300-year longevity is more frequent. Hybridizes with Eastern Redcedar in the plains states. Bighorn sheep and Townsend's solitaires have been recorded feeding on this juniper.

**WESTERN JUNIPER** *Juniperus occidentalis* Hook. **PL. 10**

A pointed-top tree mostly of the dry slopes and high country of the Sierra Nevada and Cascades. Leafy twigs about  $\frac{1}{16}$  in. thick with leaf scales *gray-green*, rather blunt, and with a distinct gland







dot. Leaves are frequently in whorls of three rather than in opposite pairs, though this is not always readily evident (use lens). Trunk is usually *single*.

Mature fruits,  $\frac{1}{4}$  in. diameter, *blue-black*, with 2–3 seeds. Bark red-brown and shreddy. Height 10–25 (85) ft.; diameter 2–3 (14) ft. Dry, rocky soils to 10,000 ft. elevation, also local in sw. Idaho, nw. and s. Calif. **SIMILAR SPECIES:** Within the range of Western Juniper, (1) Utah and (2) California junipers both have yellow-green foliage and mostly bushy growth forms. Utah Juniper leaves are without gland dots, while California Juniper has bigger reddish fruits. See (3) Rocky Mountain Juniper. **REMARKS:** In Calif., often called Sierra Juniper. Thought occasionally to live over 3000 years.

## ONESEED JUNIPER

PL. 10

*Juniperus monosperma* (Engelm.) Sarg.

A tree of the s. Rockies to cen. Ariz., w. Texas, and n. Mexico. Scalelike leaves *gray-green*, *long-pointed*, and mostly *with* a gland. Twigs stout, about  $\frac{1}{16}$  in. thick and 4-sided. Trunks usually *several*, yielding a round-topped tree. Bark shreddy. Mature fruits  $\frac{1}{8}$ – $\frac{1}{4}$  in. in diameter, dark blue; seed *single*. Height 10–20 (40) ft.; diameter 1–2 ft. Dry rocky soils, 3000–5000 ft. elevations. **SIMILAR SPECIES:** (1) Rocky Mountain Juniper, also blue-fruited, has fine ( $\frac{1}{32}$  in.) twigs, usually a single trunk, and mostly 2 seeds per fruit. (2) Utah Juniper has blunt yellow-green leaf scales without glands. (3) Ashe Juniper is not associated with Oneseed except in parts of





cen. Texas. Ashe Juniper has dark green foliage and fruits  $\frac{5}{16}$  in. in diameter. Other junipers within the distributional limits of Oneseed Juniper have reddish fruits. Beyond fruit color, (4) Alligator Juniper has distinctive alligatorlike trunk bark while (5) Weeping Juniper has unique drooping foliage. **REMARKS:** Fruits are eaten by Gambel quail, gray foxes, coyotes, raccoons, ground squirrels, chipmunks, and, occasionally, humans. Deer browse the twigs.

**UTAH JUNIPER** *Juniperus osteosperma* (Torr.) Little **PL. 10**

A mostly round-topped and several-trunked tree of the Great Basin mountains and high plains. Leaf scales yellow-green, short-pointed, *lacking* a gland. Leaves basically in alternating pairs. Twigs relatively stout ( $\frac{1}{16}$  in.) and  $\pm$  4-sided. Trunk usually single, the bark gray-brown, shreddy, sometimes weathering to nearly white. Mature fruits red-brown,  $\frac{1}{4}$ – $\frac{1}{2}$  ( $\frac{3}{4}$ ) in. in diameter, and with 1 (seldom 2) seeds; young fruits bluish. Height 15–20 (40) ft.; diameter 8–12 (36) in. Rocky hillsides and canyons, 4000–9000 ft. elevation south to s. Calif., cen. Ariz., and w. N.M. **SIMILAR SPECIES:** Mainly on the edges of Utah Juniper range: (1) Rocky Mountain and (2) Oneseed junipers have dark- or gray-green foliage and smaller mature fruits. The former species also has thin ( $\frac{1}{32}$  in.) twigs that often droop; the latter has long-pointed leaf scales. (3) Alligator Juniper has gland-dotted, long-pointed leaf scales and a unique checkered trunk. (4) California and (5) Western junipers have gland-dotted leaves. **REMARKS:** Believed to be the most common tree in Nevada and Utah. Often associated with Oneseed Juniper, Singleleaf Pine, and Two-needle Pinyon. Chipmunks eat the seeds, and deer sometimes browse the twigs.



**CALIFORNIA JUNIPER** *Juniperus californica* Carr. **NOT SHOWN**  
 Mainly a shrubby tree of deserts and foothills from n. Calif. to w. Ariz. and Baja California Norte. Leaf scales yellow-green, mostly paired, *blunt*, and *with* a gland dot. Twigs tend to be *rounded* rather than 4-sided. Fruits  $\frac{3}{8}$ – $\frac{5}{8}$  in. in diameter and reddish with a white bloom when mature, though sometimes bluish at first. Berries have 2 (sometimes 1) seeds. Trunks several, brown to gray and shreddy. Height 10–20 (40) ft.; diameter 1–2 ft. Dry soils below 5000 ft. elevations south to Baja California Norte and Guadalupe and Cedros Is., Mexico. **SIMILAR SPECIES:** In the same region, (1) Western Juniper has smaller blue-black fruits, gray-green foliage, and mostly a single reddish trunk. (2) Utah Juniper foliage lacks gland dots. **REMARKS:** Eaten by mule deer.

**ALLIGATOR JUNIPER** *Juniperus deppeana* Steud. **NOT SHOWN**  
 Mainly common in areas from cen. Ariz. and cen. N.M. south through w. Texas to cen. Mexico. The single, *heavily checkered* mature trunk resembles the thick square scales of an alligator hide. Leaves blue-green, long-pointed, glandular, and often resin-dotted. Twigs relatively thick and 4-sided. Mature fruits  $\frac{3}{8}$ – $\frac{5}{8}$  in., reddish, with 2–5 (*usually* 4) seeds. Height 20–40 (60) ft.; diameter 1–3 ft. Dry slopes, mostly at 4000–8000 ft. elevations. **SIMILAR SPECIES:** Mature trunk bark distinctive among conifers (but see under Arizona Cypress, p. 173). In w. Texas, Pinchot Juniper has smaller, brown to red fruits with only 1–2 seeds. **REMARKS:** An important food plant for wild turkeys and several herbivorous mammals of the region. Named in honor of Ferdinand Deppe, a German



*Bark of Alligator Juniper*





*Bark of Pinchot Juniper*

botanist of the 1800s. A rare variety in w. Texas is reported to have only furrowed scaly bark and drooping branchlets but to retain the mostly 4-seeded fruits of the parent species.

**PINCHOT JUNIPER** *Juniperus pinchotii* Sudw. **NOT SHOWN**

A juniper with fruits brownish red or often *bright red* when fully ripe. Leaves yellow-green, more or less long-pointed, and with a prominent gland dot. Twigs slender and tend to curve *upward*. Clumped appearance, with several stems. Bark furrowed. Often sprouts from cut or burned stumps. Fruits  $\frac{1}{4}$ – $\frac{3}{8}$  in. in diameter; seeds 1–2. Height to 20 ft. Open flats and canyons mostly from sw. Okla. and n. Texas to sw. Texas and se. N.M. **SIMILAR SPECIES:** (1) Ashe Juniper has blue fruits, shreddy bark, and twigs that are thicker, somewhat stiff, and curve downward. (2) Alligator Juniper has checkered trunk bark. **REMARKS:** Also called Redberry Juniper. Another red-berried juniper, *J. erythrocarpa* Cory, with the same common name, rarely attains small-tree size. It is recognizable mainly by its dark-banded and pitted seeds. Gifford Pinchot was the first chief of the U.S. Forest Service.

**ASHE JUNIPER** *Juniperus ashei* Buchholz. **NOT SHOWN**

This species ranges east from w. Texas to the Arbuckle and Ozark mts. of Okla., Ark., and Mo. Leaves dark green, long-pointed, and with a gland dot. Twigs somewhat stout and tending to curve *down* at the tips. Stems several, plant bushy. Bark shreddy. Mature fruits about  $\frac{5}{16}$  in. across, dark *blue* with a whitish bloom;



seeds 1–2. Height to 20 ft. Also ne. Mexico. **SIMILAR SPECIES:** See (1) Pinchot and (2) Oneseed junipers and (3) Eastern Redcedar. **REMARKS:** Often forms thickets on overgrazed and eroded soils. Valuable for fence posts. Also called Mountain-cedar. Named for William Ashe, an early U.S. Forest Service forester.

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**WEeping JUNIPER** *Juniperus flaccida* Schlecht. **NOT SHOWN**

With its main distribution in Mexico, this juniper also occurs in the Chisos Mts. of sw. Texas. Leaf scales yellow-green, long-pointed, with a gland dot. Twigs 4-sided, slender, *drooping markedly*. Trunk usually single. Mature fruits red-brown with 4–12 seeds,  $\frac{3}{8}$ – $\frac{1}{2}$  in. diameter. Height to 30 ft. Hillsides. **SIMILAR SPECIES:** No other wild juniper has such a strongly weeping habit.

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**EASTERN REDCEDAR** *Juniperus virginiana* L. **NOT SHOWN**

A medium-sized tree of the e. U.S. ranging west to the Great Plains. Leaves  $\frac{1}{16}$ – $\frac{3}{4}$  in. long, yellow-green, in pairs along 4-sided twigs and branchlets. Awl-shaped leaves  $\frac{1}{8}$ – $\frac{5}{16}$  in. long, sometimes with a gland. Heartwood reddish. Fruits hard, whitish- to blackish green berries about  $\frac{1}{4}$  in. in diameter, with 1–2 seeds. Bark dry, shreddy, not ridged. Rarely (in severely windswept locations) shrubby and creeping. Height 40–50 (62) ft.; diameter 1–2 (4) ft. Old fields and dry soils. **SIMILAR SPECIES:** (1) Ashe Juniper has darker foliage and usually several trunks. In the West, (2) Common Juniper occurs mainly in Canada. Its awl-like needles are white above; scaly leaves are lacking. (Eastern Redcedar is a juniper, not closely related to Western Redcedar, Pl. 9.) **REMARKS:** Heartwood is aromatic and of rose-brown color. It is light, strong, durable, and widely used for cedar posts. The outer bark, when stripped, dried, and rubbed between the hands, provides excellent tinder and is used in flint-and-steel and sunglass fire sets. A volatile oil derived from juniper leaves is used in perfumes, and dried berries are used as a cooking spice. In the wild, the fruits are consumed by well over 50 species of birds, including bobwhites, sharptail grouse, ringneck pheasants, and mourning doves, and also by opossums. See Remarks under Rocky Mountain Juniper.

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**COMMON (DWARF) JUNIPER** **NOT SHOWN**

*Juniperus communis* L.

Rarely a tree of northern and mountain areas, more commonly a shrub. It has sharp, hollowed, 3-sided needles that occur in *whorls of 3, whitened above*, and  $\frac{1}{4}$ – $\frac{7}{8}$  in. long. Twigs, or at least branchlets, are 3-sided. Fruits rather hard, blue-black,  $\frac{3}{8}$ – $\frac{1}{2}$  in. in diameter, and with a white powder. Seeds 1–3, usually 3. Height 1–4 (35) ft.; diameter 1–6 (12) in. Pastures and infertile soils





*Common Juniper*



from the northern limit of trees south to cen. Calif., cen. Ariz., cen. N.M., s. S.D., and e. U.S. **SIMILAR SPECIES:** Our only juniper with awllike needles strongly whitened and scaly leaves lacking. **REMARKS:** The plant supplies food for ruffed and sharptail grouse, bobwhite, European partridge, pheasant, whitetail deer, moose, and smaller birds

and mammals. Grows also throughout Europe and all of n. Asia. Oil from leaves and wood is used in perfumes, and the aromatic foliage is burned as an incense in India.

## NON-JUNIPERS

### GIANT SEQUOIA

PL. 10

*Sequoiadendron giganteum* (Lindl.) J. Buchholz

Mature specimens of this huge tree are unmistakable, and young plants can usually be recognized in association with their parents. Leaves *all* narrowly awl-shaped, blue-green, and overlapping but with tips spreading. Leaves without gland dots and mostly  $\frac{1}{8}$ – $\frac{1}{4}$  in. long but to  $\frac{1}{2}$  in. on vigorous shoots. Twigs green, round in cross section. Sprouts do *not* occur. Cones *woody* and brown,  $\frac{1}{2}$ – $2\frac{1}{2}$  in. long, with scales thick at the edge. Trunk single and often buttressed at the base; bark red-brown and up to 24 in. thick. Height 100–250 (295) ft.; diameter 10–20 (35) ft. Isolated groves, w.





*Giant Sequoia*



slopes of the Sierra Nevada at 5000–8200 ft. elevations. **SIMILAR SPECIES:** The related Redwood (Pl. 8) occurs naturally only along the Calif. coast. It has small cones, leaves both fernlike and awl-shaped, and sprouts frequently present at the trunk base and from roots. Low foliage is in flat sprays. **REMARKS:** Not reaching the height attained by some Redwoods and not as old as some Bristlecone Pines (or possibly Quaking Aspens, p. 286), but the most massive tree in the world and perhaps the world's largest organism (though Australians claim the Great Barrier Reef). Some Giant Sequoias have been estimated to be 3500 years old. One tree, cut down prior to national park establishment, is reported to have required 22 days to fell. It produced 537,000 board feet (1 ft. x 1 ft. x 1 in.) of lumber or "about as much as a portable Rocky Mountain mill [of the 1930s] would cut in five years." Called Wellingtonia in the United Kingdom, from an early scientific name that honored the Duke of Wellington.

**FIVE-STAMEN TAMARISK** *Tamarix chinensis* Lour. **PL. 10**

A *non-evergreen* tree with *true flowers* but with tiny, overlapping juniperlike leaves. Leaves  $\frac{1}{32}$ – $\frac{1}{16}$  in. long, yellow-green, pointed, *not* gland-dotted, and dropping with the twigs in autumn. Twigs cylindrical rather than 4-sided, slender, and *without* a resinous



odor when broken. In winter, some dead foliage usually present and leaf scars lacking (branchlets may show twig scars). Trunk single; bark brown, smooth to furrowed. Flowers  $\frac{1}{8}$  in. long, *pink or white*, crowded in finger-shaped twig-end clusters, spring and summer. Petals wider toward the tip. Fruits 3–5-part dry *capsules*, brown, and only  $\frac{1}{8}$  in. long, summer. Height to 20 ft.; diameter 4 in. Moist sites, mainly dry areas in Southwest. **SIMILAR SPECIES:** Junipers have evergreen foliage with a resinous odor and bluish or reddish, mostly globular, fleshy fruits. **REMARKS:** Introduced as an ornamental, this Eurasian tree has spread to the wild. It reproduces by seeds and rooted twigs throughout much of the Southwest. Provides nest sites for doves and other birds. Often called Salt-cedar. French Tamarisk (*T. gallica* L.) is a European import established mainly in the e. U.S. but reported sometimes to grow wild in California. It closely resembles Five-stamen Tamarisk, but its pink flower petals are wider near the base. Athel Tamarisk (*T. aphylla* [L.] Karst.), a dense *evergreen* tree, is established locally near the Mexican boundary from s. Texas to s. Calif.

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**REDSHANK** *Adenostoma sparsifolium* Torr.

**NOT SHOWN**

Another woody plant with true flowers and  $\pm$  coniferlike foliage. The plant is *evergreen* with leaves thin, rounded, scattered, nearly linear, and  $\frac{1}{4}$ – $\frac{5}{8}$  in. long. Flowers without stalks in showy, white, terminal clusters, July–Aug.; fruits small, dry, one-seeded. Mostly shrubby, occasionally 16–30 ft. tall. Chaparral, dry slopes below 6000 ft.; s. Calif. **REMARKS:** Also called Ribbonwood. Greasewood (*A. fasciculatum* H. & A.), a related shrub, has similar, but clustered, leaves and stalked flowers and fruits.






## BROAD-LEAVED TREES WITH OPPOSITE COMPOUND LEAVES PLATES 11-14

Only a few plants bear leaves of this type. All have once-compound foliage; none has leaves twice-compound. The identification of plants in this group is comparatively simple when foliage is present. Until one becomes experienced, however, the leaflets of compound leaves may appear to be simple leaves. A review of pp. 2-5 is recommended.

In southern locations, several tropical species are evergreen. In winter in cold climates and during dry seasons in arid locations, though, leaves may be absent from deciduous trees. Unless complete dead leaves are attached to the twigs, there is no indication of whether a plant once bore compound or simple leaves. This section of the book must then be considered in conjunction with the next, in which trees whose twigs also bear opposite (or occasionally whorled) leaf scars and buds are discussed. The twigs of a leafless unknown plant with opposite leaf scars may be compared with the illustrations in Sections II and III, or "keyed out" using the leafless key of Appendix A.

Trees of this section are shown on four plates:

- |   |                           |
|---|---------------------------|
| 1. Leaves fan-compound or trifoliate.                   | Buckeyes, etc. Pl. 11     |
| 1. Leaves feather-compound. 2                           |                           |
| 2. Ashes of the Pacific states and Ariz.                | Ashes I Pl. 12            |
| 2. Ashes of the Mexican border region and Great Plains. |                           |
|   | Ashes II Pl. 13           |
| 2. Other species.                                       | Elderberries, etc. Pl. 14 |

Many alternate-leaved plants bear stubby, scarred, leaf-crowded *spur* branches. Care should be taken that their leaves and leaf scars are not assumed to be opposite or whorled because of this crowding. Of the plants in our area with true opposite or whorled leaf scars, only a few species in the Southwest (Texas *Lignumvitae*, Pl. 14, plus Desert-olive and Texas *Forestiera*, Pl. 17) develop 



spur branches. In other areas and for other species, trees with spur branches are alternate-leaved plants of Sections IV and V. Wherever possible, twigs with uncrowded leaves or leaf scars should be selected for identification.

## TREES WITH OPPOSITE LEAVES FAN-COMPOUND OR TRIFOLIATE (PLATE 11)

The buckeyes, which in the West occur mainly in California and Texas, have 5–9 toothed leaflets arranged like the spokes of a wheel. They also have a large end bud, upright clusters of showy flowers, and large, mostly poisonous nuts encased in heavy husks.

Two western trees, Sierra Bladdernut and Barreta, regularly have opposite three-parted leaves. Several ashes (Pls. 12, 13, 16), two maples (Pls. 14, 15), an elderberry (Pl. 14), and Fernleaf Lyontree (Pl. 14) have opposite leaves that sometimes are trifoliate. Barreta may no longer exist as a tree north of Mexico.

### BUCKEYES

These are our only trees with opposite *fan-compound* leaves. End buds much *larger* than side buds and with 4 or more scales. Leaf scars large, with bundle scars several, usually in 3 groups. Flowers in large *upright* clusters at twig ends. Fruits with thick 3-part husks that contain 1–3 large shiny brown nuts. The calyx (the circle of sepals immediately exterior to the petals) is tubular and tends to be colored like the petals. The calyx tube is short ( $\frac{1}{4}$ – $\frac{3}{8}$  in.) in most species but longer ( $\frac{3}{8}$ –1 in.) in Red Buckeye. The stamens (threadlike filaments tipped by pollen-bearing anthers) are longer than the petals in most species. Seeds, young twigs, and leaves of all buckeyes sometimes are toxic to livestock. The nectar has been suspected of killing bees. The seeds are poisonous, but Native Americans rendered them edible by grinding them and passing hot water through the flour. Crushed fruits and branches have been used to kill fish for food, a practice that is now illegal.

### CALIFORNIA BUCKEYE

PL. 11

*Aesculus californica* (Spach) Nutt.

Found only in the Calif. mountains at low elevations. Prominent blossom clusters render the species highly visible between May and July. Leaves 4–8 in. long with 5 (7) fine-toothed and *long-pointed* leaflets, each 2–5 in. long. Leaflets *long-stalked*, the stalks  $\frac{1}{4}$ – $\frac{5}{8}$  in. long. Twigs and buds hairless; winter end bud quite *sticky*. Pith white. Flower clusters 4–8 in. long; individual blossoms 1–1  $\frac{1}{4}$  in. long, white to rose-colored, with 4–5 petals, May–June. Fruits 2–3 in. long, somewhat pear-shaped, husks







*California Buckeye*

without prickles and containing 1 or 2 large, smooth, brownish nuts. Height to 30 ft.; diameter to 6 in. Canyons and foothills to 4000 ft. elevation, coastal ranges and Sierra. **SIMILAR SPECIES:** No other tree with such fan-compound foliage grows wild in Calif. Horsechestnut, a planted ornamental, has leaflets without stalks, flowers with 5 petals, and nut husks prickly.

## TEXAS BUCKEYE

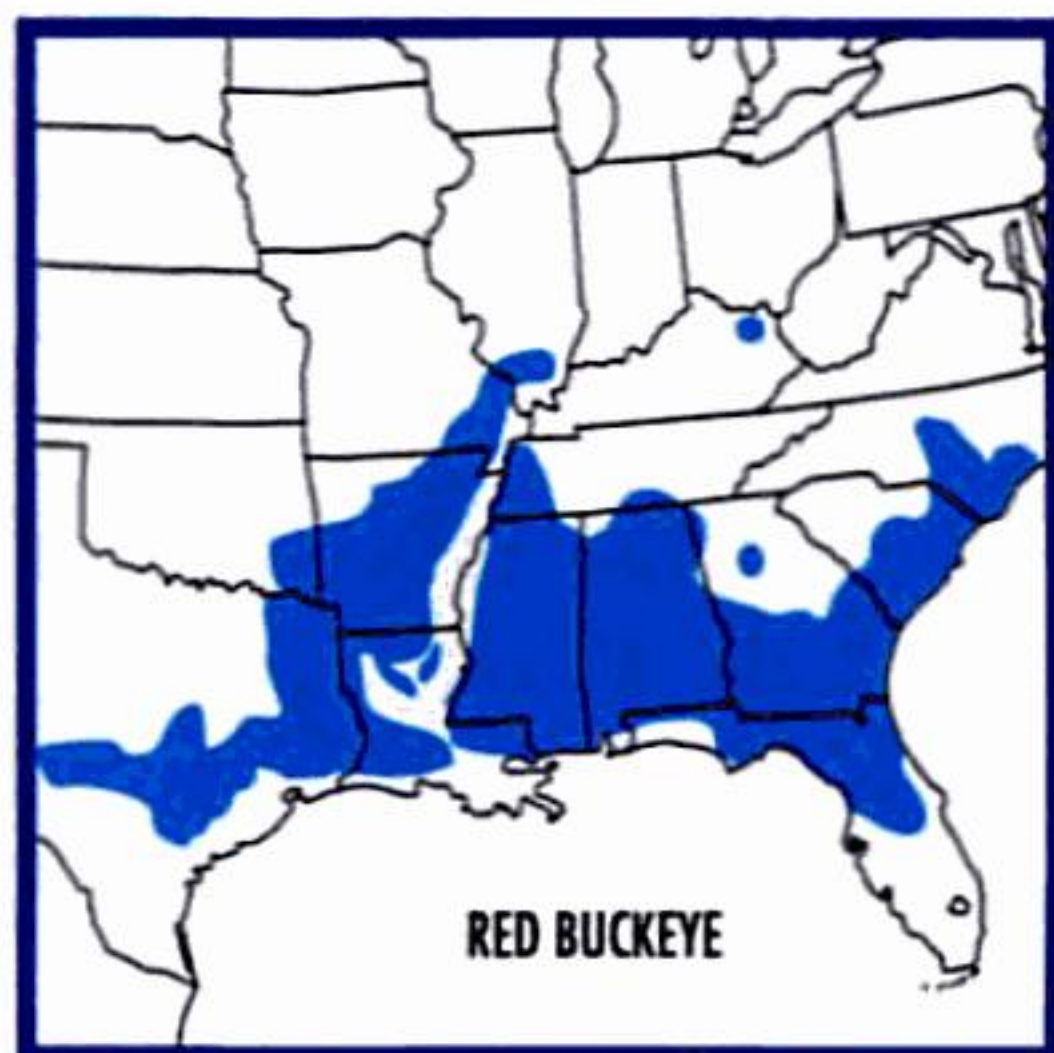
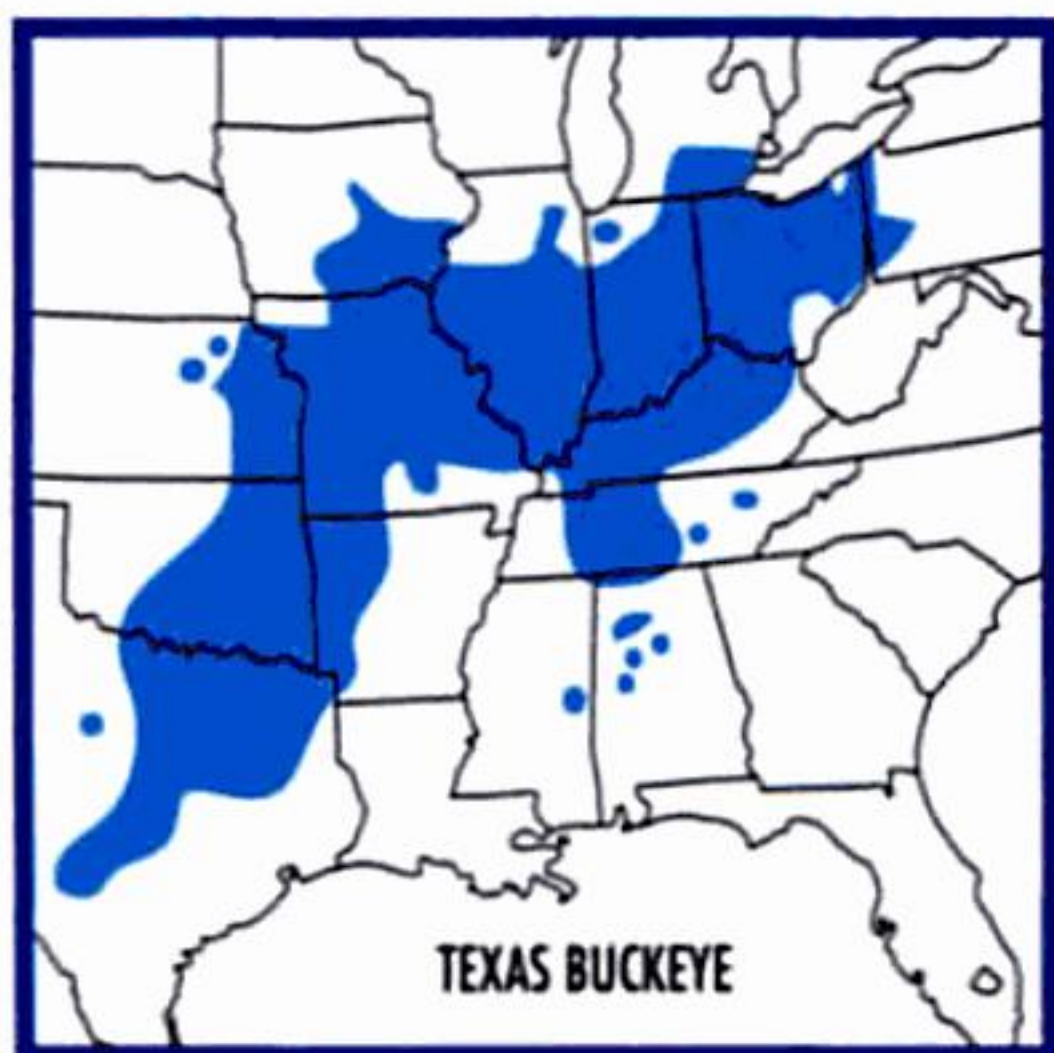
PL. 11

*Aesculus glabra* var. *arguta* (Buckl.) Robins.

Extending west from w. Mo. and e. Texas to the e. plains and the Edwards Plateau of cen. Texas, this buckeye has leaves only 4–8 in. long. Leaflets 7–11, narrow, long-pointed, each 4–6 in. long, with stalks lacking. Bud scales weakly ridged (mainly at the tip), not sticky. Pith pale brown. Flowers regularly yellowish; the calyx tube only  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, March–April. Fruits with weak prickles, occasionally none, May–June. Often shrubby but sometimes a tree to 35 ft. tall. Mature soils, cen. Texas. **SIMILAR SPECIES:** See Red Buckeye. **REMARKS:** To the east, the range of this form is contiguous with that of the Ohio Buckeye (*A. glabra* Willd. var. *glabra*), which typically has larger leaves with only 5 leaflets. Though listed as a variety of that species, the more numerous leaflets of Texas Buckeye tend to be a distinctive characteristic, and the plant is frequently classified as the full species *A. arguta* Buckl.







## RED BUCKEYE *Aesculus pavia* L.

FLOWER, PL. 11

A shrub or small tree of the se. U.S. Leaves 7–13 in. long with 5 leaflets narrow to elliptic and hairless when mature. Leaflets 1½–4 in. long, *short-stalked* or without stalks, and mostly *short-pointed*. Mature flowers and buds about ½ in. long. Bud scales with a *central* ridge and *not* sticky. Pith brown. Flower clusters 4–8 in. long, individual blossoms bright *red* with a *calyx tube* ½ in. long or more, April–May. Fruits not prickly. Height to 30 ft.; diameter to 10 in. Distributed west to Edwards Plateau of cen. Texas, where it may be *yellow-flowered*. **SIMILAR SPECIES:** Texas Buckeye leaflets are more narrow, more long-pointed, and without stalks. Its calyx tube is short and nut husks mostly with weak prickles.

## HORSECHESTNUT *Aesculus hippocastanum* L.

PL. 11

A large imported tree with leaves 4–15 in. long, leaflets 7–9, each 4–10 in. long, wedge-shaped, and *stalkless*. Winter end bud over ½ in. long, very sticky. Pith white. Height 60–75 (80) ft.; diameter 1–2 (3) ft. Flowers white, with 5 petals; clusters 6–12 in., May. Fruits with *strongly thorny husks*, Sept.–Oct. European, planted in parks and gardens. **SIMILAR SPECIES:** See California Buckeye. **REMARKS:** True chestnuts (*Castanea*) do not grow wild in the West. They are found in e. N. America and in the Old World.

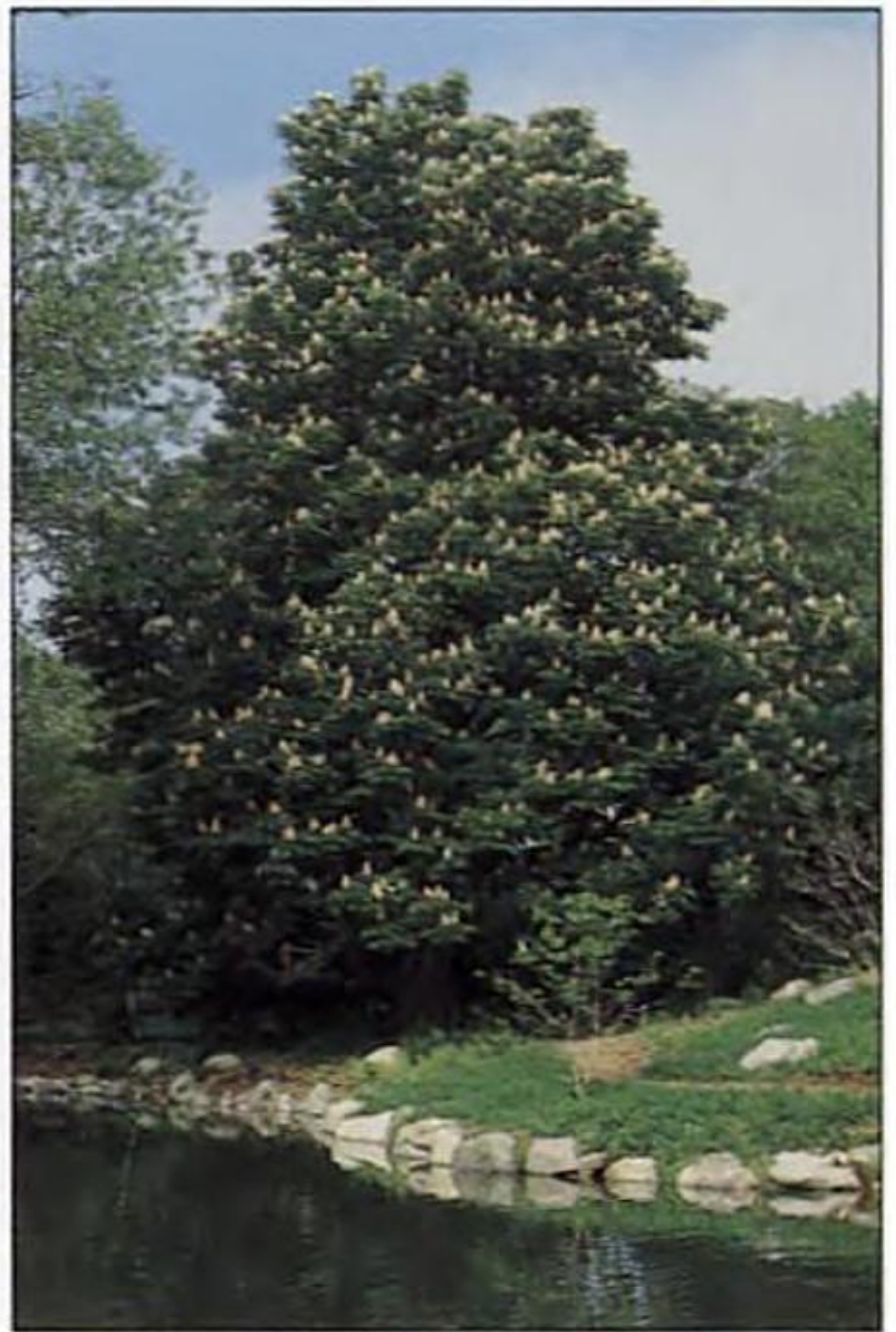
## SIERRA BLADDERNUT *Staphylea bolanderi* Gray

PL. 11

A shrub or small tree of the central Sierra and Mt. Shasta regions of Calif. Leaves 2–5 in. long with stalks 1–2½ in. long. Leaflets 3, each 1–2½ in. long, very *fine-toothed*, hairless, egg-shaped to nearly *circular* with a small *pointed tip*, and the end one *long-stalked*. Twigs greenish, slender, and hairless. End buds mostly paired, the central one missing. Bundle scars 3. Flowers white, rather showy, in drooping clusters, April–May. Fruits *inflated*







papery capsules, 1–2 in., summer. Height to 20 ft. Foothills, to 5000 ft. elevation. **SIMILAR**

**SPECIES:** None of our other woody species has such fruits. Ashleaf Maple (Pl. 14) in Calif. commonly has opposite trifoliate leaves, but the leaflets have large jagged teeth. Other opposite-leaved trees with 3-parted foliage (see chart, Pl. 11) have either

coarsely toothed or wavy-edged leafage. The hoptrees (Pls. 22, 24), have alternate trifoliate leaves and the end leaflet short-stalked.

**BARRETA** *Helietta parvifolia* (Gray) Benth.

**PL. 11**

A shrub or small tree of extreme s. Texas and ne. Mexico. Leaves *evergreen*, only  $\frac{1}{4}$ –2 in. long, with 3 blunt, hairless, *smooth-edged* leaflets and narrowly winged leafstalks. Leaflets with tiny, pitted *gland dots* (use lens), long-tapered at the base, mostly without stalks, and yielding a *citrus odor* when crushed. Flowers small,





greenish white, in twig-end or near-end branched clusters, April–May. Fruits dry but resinous, with  $\frac{1}{4}$ – $\frac{1}{2}$ -in. wings, Oct. Height to 25 ft. Dry hills. **SIMILAR SPECIES:** Gregg Ash (Pl. 13) growing in the same region has quite similar foliage, but its 3–7 leaflets lack both gland dots (use lens) and citrus odor. **REMARKS:** There is concern that Barreta may have been exterminated in Texas as a result of brush-clearing operations. The species may attain tree size only in Mexico.

## TREES WITH OPPOSITE LEAVES FEATHER-COMPOUND: ASHES I ASHES OF THE PACIFIC STATES AND ARIZONA (PLATE 12)

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The ashes (Pls. 12, 13, 16) are the largest group of trees with foliage of this type. Ash leaves are mostly deciduous, 5–12 in. long and with 3–9 (usually 5–7) leaflets, which may or may not be toothed. Leaf scars are large and shield-shaped; bundle scars are numerous, mostly in a U-shaped group; buds are mostly brown, with a somewhat granular texture. The flowers of most ashes are small, often dark, without petals and in tight groups. Two species, however, have white petals in showy clusters. Flowering is in early spring, mostly ahead of the leaves. The sexes are on separate trees in most species. The one-seeded, winged fruits of all ashes look like the blades of miniature canoe paddles. Ash trunks tend to be gray with fine fissures. Singleleaf Ash, found from the s. Rockies westward, is on Pl. 16.

The ashes yield lumber for furniture, tool handles, baseball bats, and baskets. Twigs are browsed by deer and other herbivorous animals. Flowers provide pollen for bees. Native Americans once made a dark bitter sugar from the sap of some species.

Only a few ash species can be expected to be found in a particular region. The ashes of this plate occur in the Pacific states or are mainly restricted to Ariz. The species of Pl. 13 are those that range along the Mexican border from Ariz. to Texas or on the Great Plains. Four species with ranges overlapping the two plates are cross-referenced on the charts. Species that produce 3-parted leaves also are compared on the identification chart at Pl. 11. European Ash (*F. excelsior* L.), sometimes planted, has 7–13 leaflets *not* toothed and buds *black*. *Fresno* is the Spanish name for ash.

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### OREGON ASH *Fraxinus latifolia* Benth.

PL. 12

The only ash found wild in the Pacific Northwest and an important tree in Calif. Leaves 5–12 in. long with 5–7 mostly short-pointed leaflets 3–5 in. in length. Leaflets mainly *without stalks*,





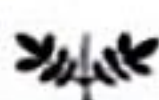
variously *hairy* beneath, and slightly toothed. Twigs usually hairy, not 4-lined. Fruits 1–2 in. long, the wing extending over  $\frac{1}{4}$  or  $\frac{1}{2}$  the length of the  $\pm$  *flattened* seed. Height to 80 ft.; diameter to 4 ft. Mature soils, mainly valleys and lower slopes, w. Wash., w. Ore., and n. coastal ranges, the Sierra, and San Bernadino Mts., Calif.

**SIMILAR SPECIES:** There are only three native Pacific Coast ashes. (1) Two-petal Ash is more shrubby and has mostly angled or 4-lined twigs, distinctly toothed leaflets and white flowers. (2) Velvet Ash has smaller leaflets with evident stalks and a different fruit wing. It does not occur north of cen. Calif. **REMARKS:** The only western ash whose lumber is harvested commercially. Native Americans used the wood for canoe paddles. Frequently planted along streets and in parks. May be evergreen in some areas.

## TWO-PETAL ASH *Fraxinus dipetala* Hook. & Arn.

PL. 12

An attractive white-flowered shrub or small tree that ranges through Calif. and south into Baja California Norte. Leaves 3–6 in. long with 3–7 *sharply toothed* hairless leaflets. Each leaflet 1–2 in. long, *short-pointed* or blunt, and with stalk  $\frac{1}{8}$ – $\frac{1}{4}$  in. long. Twigs usually somewhat 4-angled or 4-lined. Flowers in loose, drooping, branched clusters and with *two wide white petals*  $\frac{3}{16}$  in. long and about  $\frac{1}{8}$  in. across, *not* fragrant. Fruits  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. long, *flattened* and winged *to the base* of the seed. Height to 20 ft. Dry slopes, foothills. **SIMILAR SPECIES:** The only Calif. ash with either white flowers or 4-angled twigs. (1) Oregon and (2) Velvet ashes, also occurring in Calif., are larger trees with leaves not sharply toothed and fruits not winged to the base. Oregon Ash has larger leaves and leaflets without stalks, while Velvet Ash has foliage







sometimes hairy. (3) Fragrant Ash (Pl. 13), the only other ash with white blossoms, occurs from Ariz. eastward. It has long-pointed leaflets and 4 longer and narrower flower petals. **REMARKS:** Planted for ornament. Browsed by mule deer.

VELVET ASH *Fraxinus velutina* Torr.

PL. 12

A variable southwestern ash found from cen. Calif., s. Nev., sw. Utah, and w. Texas to n. Mexico. Leaves 4–6 in. long with 3–5 leaflets, each 1–3 in. long, pointed at both ends, mostly wavy-toothed toward the tip and either hairless or velvet-hairy beneath. May display some simple leaves (see Singleleaf Ash, Pl. 16). Leaflet stalks often  $\frac{1}{8}$ – $\frac{1}{4}$  in. long. Twigs hairless or long-hairy and without lines. Fruits  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. long, the wing blunt, no longer than the plump seed, and extending along the seed less than  $\frac{1}{4}$  the seed length. Height to 40 ft.; diameter to 1 ft. Watercourses to 6500 ft. elevation. **SIMILAR SPECIES:** Distinctive when hairy or plump seeds present. Otherwise, in Calif. see (1) Two-petal Ash and (2) Oregon Ash. Eastward, see (3) Fragrant and (4) Chihuahua ashes (Pl. 13). **REMARKS:** Velvet Ash is a rapidly growing tree frequently used in landscaping in the Southwest. In the wild, an indicator of underground water.

LOWELL ASH *Fraxinus lowellii* Sarg.

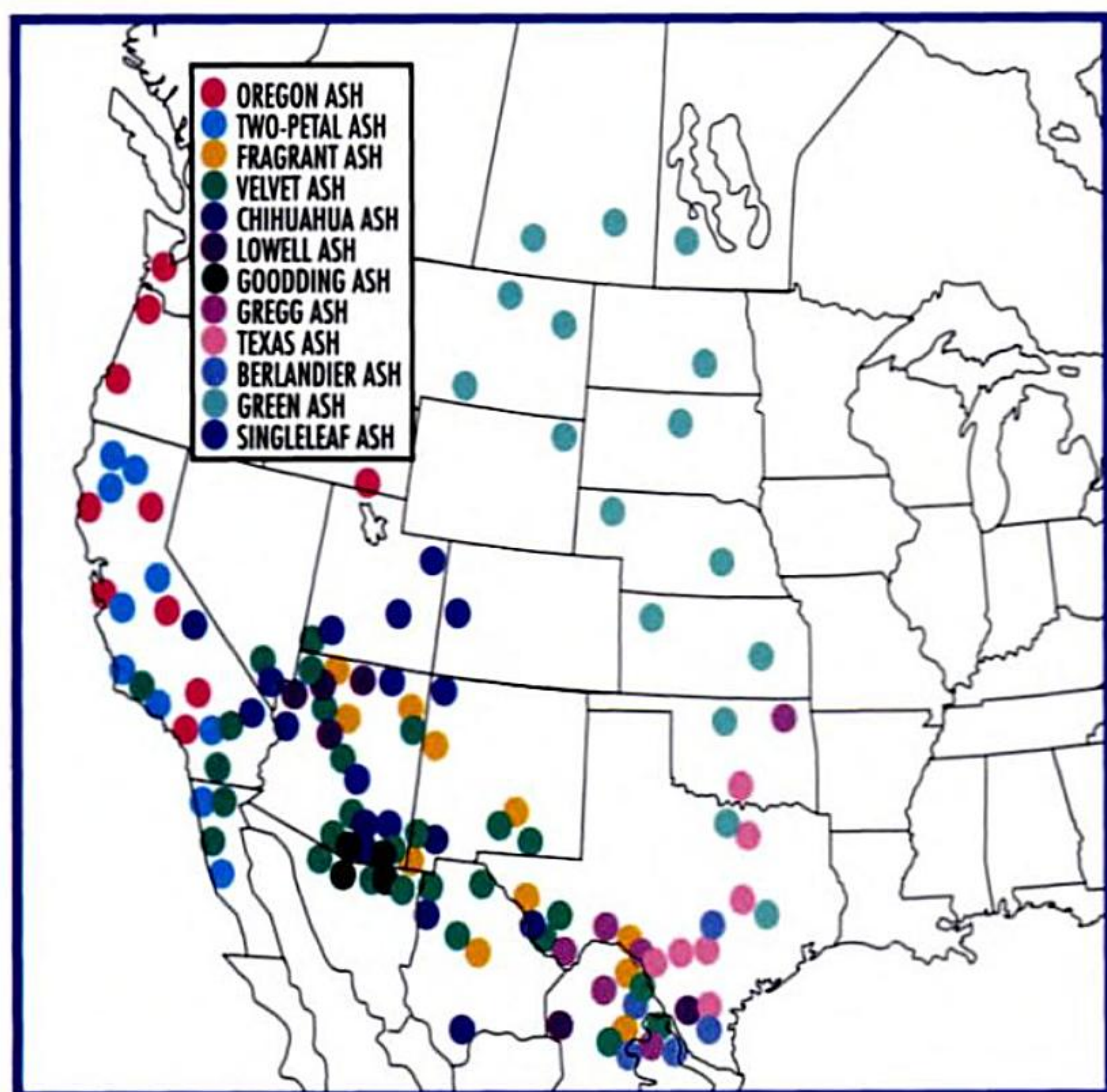
PL. 12

Reported only from n. and cen. Ariz. Leaves 3–6 in. long, with 3–7 short-pointed, hairless, and somewhat leathery leaflets each 2–3 in. long. Leaflets *toothed*, egg-shaped or elliptical, and often *without* leafstalks. Twigs hairless and 4-angled or 4-lined. Fruits  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. long and *flattened*; the wing broad, blunt, about as long





as the seed and extending to the seed base. Height to 25 ft. Canyons and watercourses. **SIMILAR SPECIES:** (1) Two-petal Ash has 4-lined twigs but grows wild only in Calif. (2) Singleleaf Ash (Pl. 16), likewise with 4-lined twigs, occurs in Ariz. but normally has only simple leaves. In either its simple or 3-leaflet form, however, the end leaflet tends to be circular in outline. Its fruits, in addition, are under  $\frac{3}{4}$  in. long. (3) Fragrant Ash (Pl. 13), also in Ariz., has leaflets long-pointed and stalked plus twigs unlined. **REMARKS:** A close relative of Singleleaf Ash and considered by some botanists to be only a variety of it. Discovered by Percival Lowell (1855–1916), an American astronomer.





**GOODDING ASH** *Fraxinus gooddingii* Little **PL. 12**

A *small-leaved* shrub or small tree known only from the mountains of se. Ariz. and nearby Sonora, Mexico. Leaves only 1–3¼ in. long and with leafstalk and midrib narrowly *winged*. Leaflets 5–9 (mostly 7), *short-pointed*, ⅝–1 in. long, stalkless, and sometimes *partly fine-toothed*. Twigs and leaflet undersides somewhat brown-hairy. Fruits ½–1 in. long; the wing broad, *blunt*, longer than the *flattened* seed, and extending *almost* to the seed base. Height to 20 ft. Rocky slopes and ridges. **SIMILAR SPECIES:** Among American ashes, only this species and Gregg Ash (Pl. 13) have such small leaves. Gregg Ash, found eastward, has shorter hairless leaves that generally are not toothed. Its fruit wing, too, is more pointed. **REMARKS:** The Peña Blanca and Sycamore Canyon areas in the Coronado Nat'l. Forest west of Nogales, Ariz., are sites for this tree. The tree is named for Leslie N. Goodding, an American botanist who discovered the species in 1934.

**TREES WITH OPPOSITE LEAVES**  
**FEATHER-COMPOUND: ASHES II**  
**ASHES OF THE MEXICAN BORDER REGION**  
**AND THE GREAT PLAINS (PLATE 13)**

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These species, plus Velvet Ash and Goodding Ash (Pl. 12), occur mostly from Ariz. to Texas in the region bordering Mexico. Green Ash, primarily of the e. U.S., ranges westward through the n. plains states and has been planted elsewhere in the West. Where leaves are 3-parted, see also chart opposite Pl. 11.

**FRAGRANT ASH** *Fraxinus cuspidata* Torr. **PL. 13**

A white-flowered ash found in scattered localities from n. Ariz. to Texas and south into n. Mexico. Leaves 3–6 in. long, with leaflets 3–7, each 1½–3 in. long, stalked, hairless, usually sharply toothed, and *long-pointed*. Twigs hairless, neither angled nor marked with lines; buds sticky. Flowers *fragrant*, each with 4 *narrow white petals* about ⅝ in. long and ⅓ in. wide, in loose, drooping, branched clusters. Fruits ¾–1¼ in. long, *flattened*, and *winged to the seed base*. Height to 20 ft. Dry slopes. **SIMILAR SPECIES:** The only ash with white petals found east of Calif. and our only ash with petals only ⅓ in. wide and with flowers strongly scented. When flowers are absent: (1) Velvet Ash (Pl. 12) has leaves sometimes hairy beneath and fruits with plump seeds not winged to the base, (2) Chihuahua Ash has leaflets whitened beneath and without stalks, (3) Lowell Ash (Pl. 12) and (4) Singleleaf Ash (Pl. 16) have twigs 4-angled or 4-lined. (5) Goodding Ash (Pl. 12) has leaves only 1–3¼ in. long with winged midribs and leafstalks.





**CHIHUAHUA ASH** *Fraxinus papillosa* Lingelsh. **PL. 13**

Localized in the n. Mexican mountains of Sonora and Chihuahua plus se. Ariz., sw. N.M., and w. Texas. Leaves 3–6 in. long, somewhat leathery, with 5–9 leaflets. Leaflets  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, short-pointed, *hairless*, essentially *stalkless*, with fine teeth or none, and *whitish* beneath. Twigs hairless and unlined. Fruits 1– $1\frac{1}{4}$  in. with tips blunt, wing longer than the *flattened* seed and *not* extending to the seed base. Height to 20 ft. Rocky slopes. **SIMILAR SPECIES:** (1) Velvet Ash has leaves hairy and/or green beneath, leafstalks over  $\frac{1}{8}$  in. long, and seeds plump. See (2) Fragrant Ash. **REMARKS:** The name of the Mexican state and of this ash is pronounced chee-WAH-wah.

**GREGG ASH** *Fraxinus greggii* Gray **PL. 13**

Like Goodding Ash (Pl. 12), a small-leaved ash with *winged* leafstalk and midrib (use lens). Leaves only 1– $2\frac{1}{2}$  in. long, and with 3–7 leaflets, each  $\frac{1}{2}$ – $1\frac{1}{4}$  in. long, hairless, often leathery, and with tips somewhat *rounded*. Leafstalks short or lacking. Sometimes wavy-toothed. Twigs hairless or slightly gray-hairy. Fruits  $\frac{1}{2}$ – $\frac{3}{4}$  in. long with the wing *narrowed* at the tip, longer than the *plump* seed and extending *partly* toward the seed base. Height to 20 ft. Rocky soils, Big Bend National Park to Del Rio, Texas, and over much of ne. Mexico. **SIMILAR SPECIES:** No other Texas ash has such small leaves or winged leafstalks. (1) Barreta (Pl. 11) has 3 leaflets, pitted gland dots (use lens), and a citrus odor when crushed. See (2) Texas Lignumvitae (Pl. 14). In Ariz. and adjacent Mexico, see (3) Goodding Ash (Pl. 12). **REMARKS:** Josiah Gregg of Independence, Mo., was active in the Southwest as a trader, author, and botanist during the early 19th century.

**TEXAS ASH** *Fraxinus texensis* (Gray) Sarg. **PL. 13**

A tree mainly of cen. Texas but distributed locally from s. Okla. to s. Texas. Leaves 5–8 in. long and with 5 (7) hairless, *round-toothed* leaflets. Leaflets variably short-pointed or blunt, 1–3 in. long and  $\frac{1}{2}$  to  $\frac{2}{3}$  as broad. Leaflet stalks  $\frac{1}{4}$ –1 in. long. Twigs usually hairless; leaf scars often somewhat *notched* at the top. Fruits  $\frac{3}{4}$ – $1\frac{1}{4}$  in. long with the wing *twice* the length of the *plump* seed and *not* extending much, if any, upon it. Height to 50 ft.; diameter to 3 ft. Shallow to deep soils, especially those derived from limestone. **SIMILAR SPECIES:** Two other ashes with large leaves occur in cen. Texas. Both have longer leaflets. (1) Berlandier Ash also has long-pointed leaflets, and (2) Green Ash also has shorter and narrowly winged leaflet stalks plus longer fruits. **REMARKS:** Considered by some to be a variety of White Ash (*F. americana* L.), a species widespread in the e. U.S.





**BERLANDIER ASH** *Fraxinus berlandierana* A. DC. **PL. 13**

The *long* and mostly *long-pointed* leaflets and *broad-winged* fruits of this s. Texas ash are helpful field marks. Leaves 4–10 in. long with 3–5 hairless leaflets, each 3–4 in. long and with widely spaced small teeth or none. Leaflet stalks  $\frac{1}{8}$ – $\frac{1}{4}$  in. long. Fruits 1–1½ in. long, the wing 1–1½ times the length of the somewhat *plump* seed and extends to near the seed base. Fruits sometimes 3-winged. Height to 30 ft. Along watercourses from cen. Texas to ne. Mexico. **SIMILAR SPECIES:** See Texas Ash. **REMARKS:** The Swiss botanist Jean Louis Berlandier collected plants in Texas and Mexico in the early 19th century. Also called Mexican Ash.

**GREEN ASH** *Fraxinus pennsylvanica* Marsh. **PL. 13**

An eastern U.S. species whose natural distribution extends west to the e. foothills of the Rocky Mts. in Alta. and Mont. and south through the Great Plains states to Texas. Leaves 8–12 in. long with leaflets mostly 7–9, hairless, 4–6 in. long, and *long-pointed*. Leaflets sharply but irregularly toothed or without teeth. Leaflet stalks *minimal* to about  $\frac{1}{8}$  in. long, with the leaflet blade tending to follow along its stalk and causing it to be somewhat *winged* (use lens). Twigs hairless. Fruits 1–2 in. long, with the wing only about as long as the seed and not bordering the seed. Height to 70 ft.; diameter to 2 ft. Alluvial and mature soils. **SIMILAR SPECIES:** (1) Ashleaf Maple (Pl. 14) leaflets have large jagged teeth. (2) Texas Ash has leaflets round-toothed, often short-pointed, and under 3 in. long. **REMARKS:** The most widely distributed American ash. Also planted in Utah and elsewhere west of its natural range. Often used for paddles and oars. Formerly separated into Red and Green ashes. Planted in windbreaks on the plains.

**ELDERBERRIES AND OTHER TREES WITH  
OPPOSITE FEATHER-COMPOUND LEAVES  
(PLATE 14)**

The ashes (Pls. 12 and 13) and the few species of this plate are our only trees with this type of foliage. Those on this plate have leaflets mostly toothed and 3–16 per leaf. Most are deciduous trees with twigs hairless and *ringed* at the nodes. The trees whose leaves may sometimes have 3 leaflets also are listed on the identification chart of Pl. 11.

**FERNLEAF LYONTREE** **PL. 14**

*Lyonothamnus floribundus* var. *asplenifolius* (Greene) Bdg.

An *evergreen* tree unique in foliage and natural distribution. In its compound-leaved form, the 3–9-in. *fernlike* leaves have 3–7 nar-



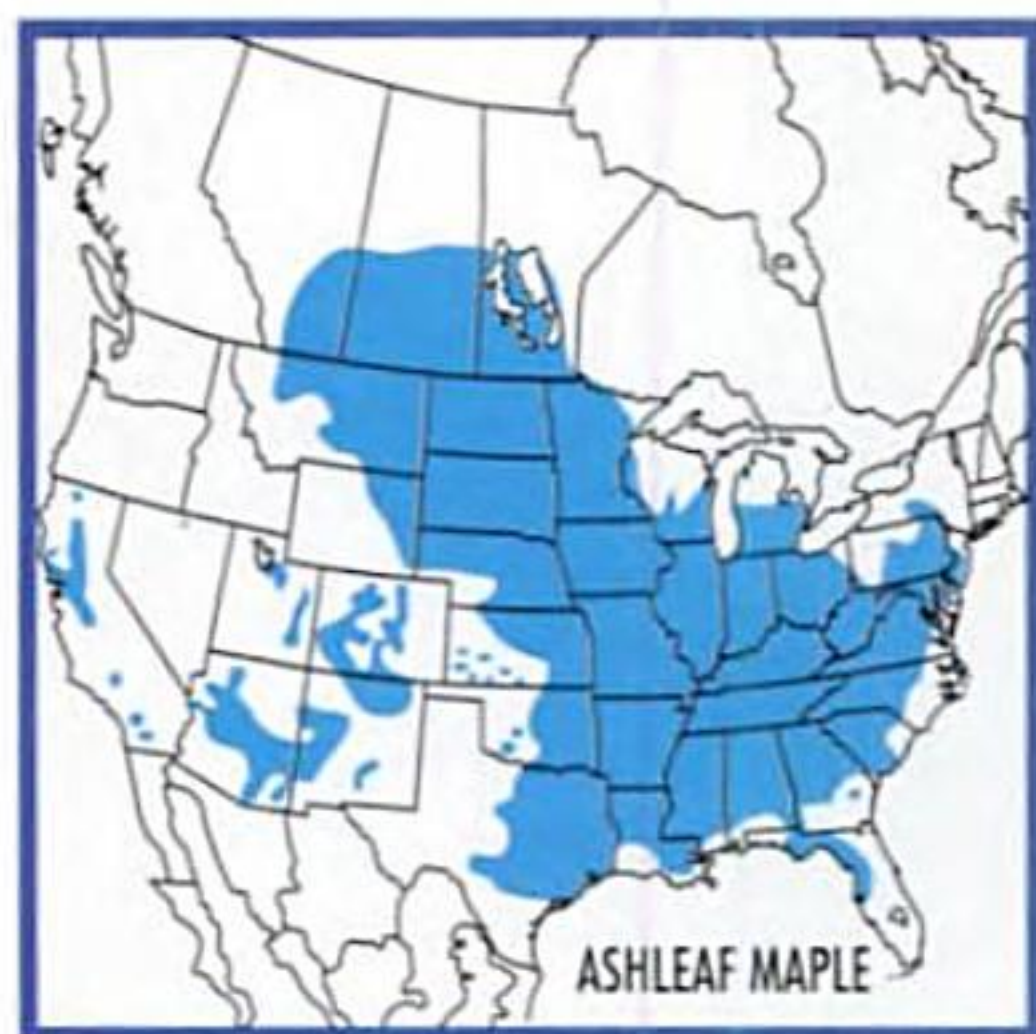


row leaflets, each 3–7 in. long, unstalked, and more or less deeply divided into many *crescent-shaped* teeth or lobes. Leaflet undersides are white-hairy or hairless, while major side veins tend to be parallel (use lens). Twigs hairy. Flowers white, small ( $\frac{1}{4}$  in. across) in mostly flat-topped twig-end clusters, 4–8 in. broad, May–June. Fruits small, dry, brownish, sometimes partly hairy capsules. Bark thin, peeling in long strips. Height to 50 ft., often with several stems. Native on the s. Calif. islands of Santa Rosa, Santa Cruz, and San Clemente. A simple-leaved form, variety *floribundus*, is also illustrated here but is described on p. 210. It occurs naturally only on nearby Santa Catalina I. **REMARKS:** Occasionally planted in parks in frost-free areas on the mainland. Believed to have been more widespread in earlier geologic times, before sea levels rose to create islands on which the species survived. Named for William S. Lyon, a government scientist who collected plants on Santa Catalina I. in the late 1800s.

## ASHLEAF MAPLE (BOX-ELDER) *Acer negundo* L. PL. 14

Our only maple with invariably compound leaves. Common east of the Rockies and in Calif. Somewhat scattered through the southwestern states and becoming naturalized in the Pacific Northwest. Leaves 4–10 in. long with 3–5 (7) leaflets over most

*Ashleaf Maple*







*Bark of Red Elderberry*

of its range and mostly trifoliate in Calif. (var. *californicum* [Torr. & Gray] Sarg.). Leaflets 2–5 in. long, usually at least half as wide, hairless, and mostly with teeth *large* and *jagged*. Twigs green or purplish, frequently white-powdered, sometimes glossy or even slightly hairy. Leaf scars narrow, *meeting in raised points* on opposite sides of the twigs. Pith narrow. Bundle scars 3 (or 5); buds white-hairy. Flowers small, greenish, March–April; fruits double-winged “keys,” Sept.–Oct. Height 50–75 ft. **SIMILAR SPECIES:** No other ashlike tree has jagged leaf teeth and leaf scars meeting in raised points. Elderberries mostly have thicker twigs, with wide pith. **REMARKS:** In the trifoliate form the leaves often resemble those of Poison-ivy (*Toxicodendron radicans* [L.] Kuntze) or Poison-oak (*Toxicodendron diversilobium* (Torrey & Gray) Greene), shrubs or vines with alternate leaves. Box-elder, a widely used name, fails to indicate proper relationships. The soft white wood is used for boxes. Syrup can be made from the sap. Squirrels and songbirds eat the seeds.

## ELDERBERRIES

Never becoming tall trees, this group includes several shrub species and some that reach small tree size. Twigs thick but weak, usually with large pithy centers. Surface wartlike lenticels com-





mon. Leaf scars large with connecting lines between pairs; bundle scars 5 (3–7). Buds small, green or brown. Unlike ashes, the central end bud is usually *missing*. Flowers small, white, in wide and (except Red Elderberry) *flat-topped* clusters at the twig ends. Fruits juicy, 3–5-seeded berries, purplish or red in color. They must be cooked but can be made into jams, jellies, and pies. The berries are eaten by many wild birds and mammals. Deer and elk browse the twigs.

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**RED ELDERBERRY** *Sambucus racemosa* L.

PL. 14

Alone among western tree elderberries in having fruits *bright red* and in *cone-shaped* clusters. Leaves 4–11 in. long, with 5–7 fine-toothed but otherwise variable leaflets each 2–6 in. long. Leaf bases even or not. Pith brown, sometimes pale. Flower clusters 3–4 in. across, March–July; fruits about  $\frac{3}{16}$  in. diameter, June–Oct. Height to 20 ft. Forest edges at low elevations, near the coast from sw. Alaska to n. Calif. **SIMILAR SPECIES:** A shrubby form (var. *microbotrys* [Rydb.] K. & P.) occurs widely through the West.

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**BLUE ELDERBERRY** *Sambucus caerulea* Raf.

PL. 14

Widespread in the western mountains, typically a *large-leaved* elderberry whose leaflets are *uneven-based* and mostly *long-stalked*. Leaves 5–8 in. long with 5–9 mostly long-pointed, *hairless*, and fine-toothed leaflets. Leaflets 2–6 in. long, the side ones with  $\frac{1}{4}$ – $\frac{1}{2}$ -in. stalks. Pith white or pale brown. Flower clusters flat-topped, 2–8 in. across, June–Sept. Fruits  $\frac{1}{4}$  in. across, dark *blue* to black with a *whitish coating*, the combination often resulting in a sky blue color. Height to 25 ft. Thickets to 10,000 ft. elevation. **SIMILAR SPECIES:** (1) Red Elderberry is coastal with brown pith, cone-shaped flowers, and red fruits. (2) Common Elderberry occurs east of the Rockies and has larger even-based leaflets plus dark





fruits without a whitish coating. **REMARKS:** Sometimes planted for ornament. Native Americans are reported to have hollowed the soft twigs to make flutes and whistles. Some authors combine Blue, Velvet, and Mexican elderberries as Blue Elderberry (*S. mexicana* C. Presl.).

## VELVET ELDERBERRY

PL. 14

*Sambucus velutina* Durand & Hilgard

A tree whose principal distribution is in the cen. Sierra Nevada but which also occurs in scattered localities throughout much of Calif. and adjacent portions of Nev. and Ariz. Leaves 5–7 in. long with 3–5 leaflets, each *only* 1–2½ in. long. Leaflets fine-toothed, mostly *short-pointed*, and *bases uneven*. Side leaflets *short-stalked*. Leaflets and twigs *velvet-hairy*. Pith *white*. Flower/fruit clusters 2–8 in. across. Fruits ⅜–¼ in. in diameter and *dark blue* to black *with* a whitish waxy coating. Height to 20 ft. Slopes, 3000–8000 ft. elevation. **SIMILAR SPECIES:** See Mexican Elderberry, with leaflets also short. **REMARKS:** See under Blue Elderberry.

## MEXICAN ELDERBERRY *Sambucus mexicana* C. Presl. PL. 14

Common in Central America and Mexico, extending north to n. Calif., w. Nev., cen. Ariz., and sw. N.M. Like Velvet Elderberry but



*Mexican Elderberry*





hairless and with leaflets usually *long-pointed*. Leaflet bases mostly *even*. Pith *pale brown*. Fruits  $\frac{3}{16}$ – $\frac{1}{4}$  in., *black*, *without* a whitish bloom. Height to 35 ft. Along watercourses to 4000 ft. elevation. See Remarks under Blue Elderberry.

**COMMON ELDERBERRY** *Sambucus canadensis* L. **PL. 14**

An eastern elderberry whose range extends west across the southern *plains* states. Leaves 5–11 in. long, with 5–11 leaflets. Leaflets  $2\frac{1}{2}$ –5 in. long, 1–1  $\frac{1}{2}$  in. wide and somewhat variable but usually *even-based*. Twigs stout; pith large, white. Flower clusters 4–7 in. across, June–July. Fruits mostly under  $\frac{3}{16}$  diameter, purple-black, and *without* a whitish coating. Height to 15 ft.; diameter to 3 in. Thickets. **SIMILAR SPECIES:** No other tree-size elderberry occurs east of the Rockies.

**TEXAS LIGNUMVITAE** *Guaiaacum angustifolium* Engelm. **PL. 14**

An *evergreen* tree of w.-cen. and s. Texas. Its distribution follows the Rio Grande in Texas and extends into ne. Mexico. A clumped species usually with many short, stout, *stiff*, *opposite*, spurlike side branches. Foliage often clustered at nodes but leaves clearly opposite on vigorous twigs. Leaves filmy-feathery, 1–3 in. long, with 4–8 pairs of thin, *stalkless*, *toothless*, leathery, shiny leaflets with *tiny*, *sharp tips*. End leaflet missing. Leaves *fold* at night and midday. Leafstalks grooved. Stipules  $\frac{1}{8}$ – $\frac{3}{16}$  in. long, spiny in appearance. Flowers a beautiful purple with yellow stamens, fragrant,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, long-stalked, at leaf angles. Fruits  $\frac{1}{2}$  in. long, heart-shaped, dry capsules, usually with 2 red or yellow shiny seeds. Height to 20 ft. Brushy plains and canyons. **SIMILAR SPECIES:** Dry leaves may have to be soaked to determine their nature. Once recognized as a species with opposite compound





leaves, however, there is nothing else like it (but see Gregg Ash, Pl. 13). **REMARKS:** Useful for fence posts. An important honey species. Often placed in the genus *Porlieria*. *Lignumvitae* means "tree of life," reportedly carried over from the medicinal values of a related tropical species. Bark of roots sometimes used as soap. Mexican name is Guayacan (gway-ah-CAHN).







## BROAD-LEAVED TREES WITH OPPOSITE SIMPLE LEAVES PLATES 15-17

Trees with opposite simple leaves are so few as to be rather easily identified. When leafless, though, plants with opposite leaf scars may be members of either Section II or Section III. Then the illustrations for both sections must be reviewed (see also Appendix A). Care should be taken that the leaves or leaf scars on the stubby, scar-crowded spur branches (see Fig. 3, p. 6) of some alternate-leaved plants are not interpreted as opposite or whorled. Camphortree (Pl. 30), Desert-willow (Pl. 39), and Cascara Buckthorn (Pl. 43), though mainly alternate-leaved, may have some opposite foliage. In s. Texas, see Devils' Claws, p. 212.

Trees bearing opposite simple leaves may be identified as follows:

- |   |               |
|---|---------------|
| 1. Leaves lobed.                          | Maples Pl. 15 |
| 1. Leaves not lobed. 2                    |               |
| 2. Leaves toothed or wavy-edged.          | Pl. 16        |
| 2. Leaves neither toothed nor wavy-edged. | Pl. 17        |

### TREES WITH OPPOSITE SIMPLE LEAVES LOBED: MAPLES (PLATE 15)

Maples are the *only* native western trees with foliage of this type. The first 5 species grow wild. These and others from the e. U.S. and from Europe and Asia are often planted in parks and gardens. Buds are reddish in western species and in Red Maple, an eastern tree often planted. In all maples, leaves are *opposite*, leafstalks are *long*, twigs are *nearly ringed* by leaf scar pairs, bundle scars are three. Flowers are small and greenish. Fruits are paired, dry, winged "*keys*." Ashleaf Maple (Pl. 14) has compound foliage; Western Mountain Maple may have some trifoliate leaves (see identification chart opposite Pl. 11).





**BIGLEAF MAPLE** *Acer macrophyllum* Pursh**PL. 15**

A species of the coastal ranges and Sierra Nevada with leaves *very* large. Leaves 16–24 in. in length including 8–1-in. stalks, mostly 5-lobed and with only a *few* large, *blunt* teeth. Leafstalks contain *milky* sap (best seen at the leafstalk base when newly separated from the twig). Twigs *stout*; buds *blunt*, many-scaled. Flowers in *slender*, many-flowered, drooping clusters 4–6 in. long, fragrant, April–May. Single fruits 1½–2 in. long; paired keys narrowly V-shaped, May–July. Height to 100 ft.; diameter to 3½ (8) ft. Low and middle elevations, deep soils, from sw. B.C. to s. Calif. **SIMILAR SPECIES:** No other far-western maple has lengthened flower/fruit clusters or such large leaves and fruits. Norway Maple of the East, sometimes planted for ornament, also has milky leafstalk sap, but its leaves are only 5–9 in. long. **REMARKS:** Wood useful for furniture, paneling, and veneer. Reported to yield sap of a quality suitable for making good maple syrup. Provides important browse for deer and elk; seeds eaten by squirrels, chipmunks, and some songbirds.

**WESTERN MOUNTAIN MAPLE** *Acer glabrum* Torr. **PL. 15**

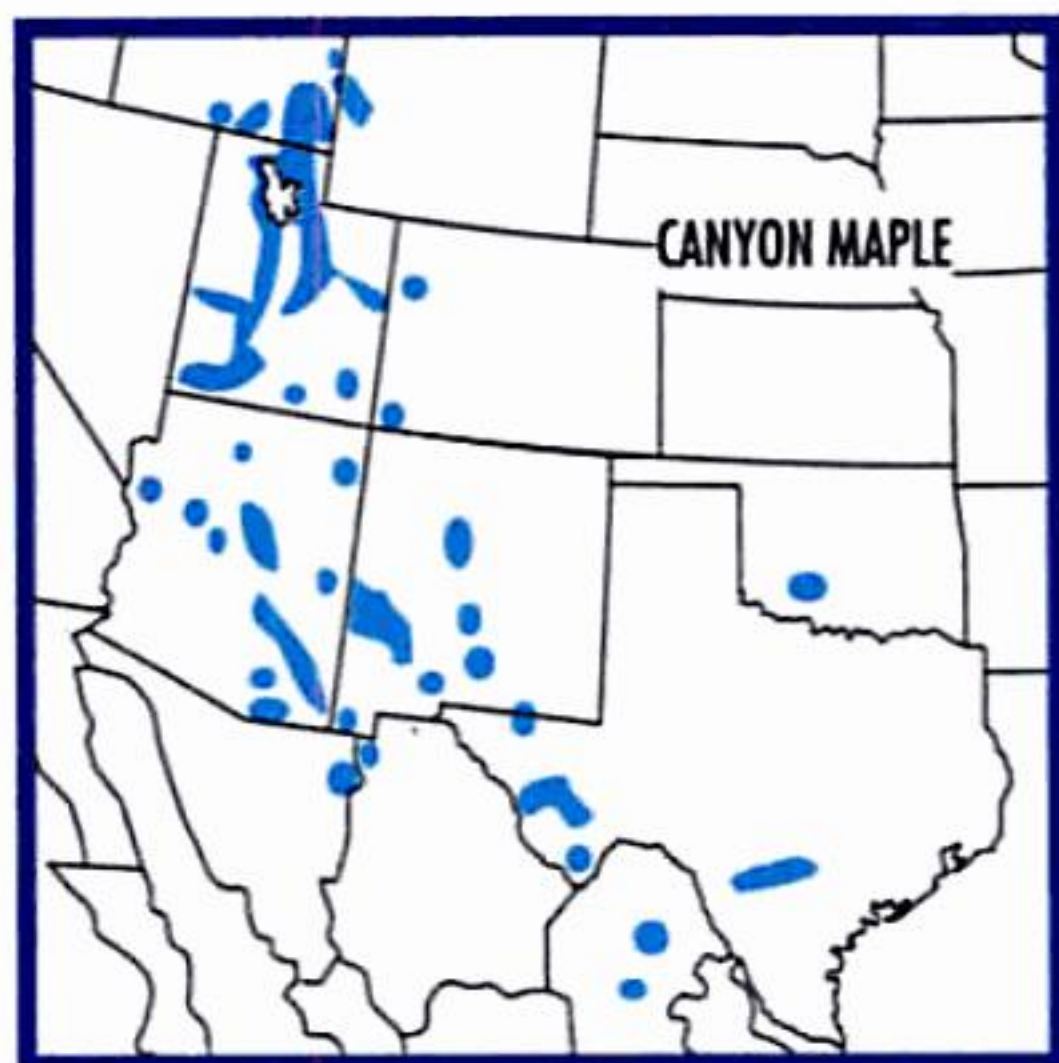
A clumped shrub or small tree spread widely in the western mountains from lowlands in se. Alaska to higher elevations near



*Western Mountain Maple*







the Mexican border. Leaves 4–7 in. long, 3 (5) lobed, with many small, coarse, *sharp* teeth. Leafstalks reddish. Sometimes the leaves are divided into three distinct leaflets (see identification chart opposite Pl. 11). Twigs slender, red-brown, *hairless*; buds *pointed*, stalked, with 2 scales. Pith *pale* brown. Flower clusters 1–3 in. long, umbrellalike, few-flowered, *drooping*, May–July. Single fruits  $\frac{3}{4}$ –1 in. long, the paired keys angled at about 45 degrees or less, Aug.–Sept. Height to 40 ft.; diameter to 15 in. Moist sites. **SIMILAR SPECIES:** (1) Canyon Maple has blunt leaf teeth and mostly 4 bud scales. (2) Vine Maple has nearly circular leaves with 7–9 lobes and stems that often do not stand upright. (3) Dogwoods (Pl. 17) when leafless have fleshy fruits and pith either white or darker brown. See also (4) Eastern Mountain Maple. **REMARKS:** Also called Rocky Mountain Maple or Douglas Maple. Several varieties have been recognized.

## EASTERN MOUNTAIN MAPLE

**NOT SHOWN**

*Acer spicatum* Lam.

A small tree or shrub of e. Canada and ne. U.S. whose range extends west across s. Man. to s.-cen. Sask. Differs from Western Mountain Maple in having leaves 4–10 in. long, single fruits  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, twigs mostly with *fine hairs* (especially toward the tips), and *slender* flower clusters *upright*. Height to 20 ft. Moist sites.

## CANYON MAPLE *Acer grandidentatum* Nutt.

**PL. 15**

With its range centered in Utah's Wasatch Mts., this species is established locally from ne. Idaho to sw. Okla., cen. and sw. Texas, and n. Mexico. Leaves *small*, 2–4½ in. long and equally wide, with a few widely spaced *blunt* teeth. Leaves with 3 (5) lobes and sometimes velvety beneath. Twigs slender; buds *pointed*, with *about* 4 scales. Flowers long-stalked, in short, *drooping*,







branched, rounded clusters, April–May. Single keys  $\frac{1}{2}$ –1 in. long, in U-shaped pairs, June–Sept. Height to 40 ft.; diameter to 1 ft. Moist soils, 2000–7000 ft. elevations. **SIMILAR SPECIES:** The only wild western maple with small blunt-toothed leaves and pointed 4-scaled buds. **REMARKS:** Also known as Bigtooth Maple. Related to Sugar Maple (*A. saccharum* Marsh) of the East and, like it, often tapped to secure sap for boiling and syrup preparation. Sometimes known as Sugar Maple. That name is better reserved, however, for the eastern species that yields the maple sugar and maple syrup of commerce, two of the few foods native to North America.

#### VINE MAPLE *Acer circinatum* Pursh

PL. 15

A maple of the Pacific Northwest whose weak and *often reclining* stem may prevent it from reaching tree height. Leaves 3–6 in. long, almost *circular* in outline. Leaf lobes 7–9, *sharply toothed*. Twigs slender, green or *purplish*; buds blunt, with 2–4 scales. Flowers in rounded clusters, spring. Single fruits  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; paired keys form nearly a straight line, autumn. Height to 40 ft. but stems sometimes even trailing and vinelike. Damp coastal forest to 5000 ft. elevation, from sw. B.C. to n. Calif. **SIMILAR SPECIES:** No other wild American maple has many-lobed circular leaves. **REMARKS:** May form dense thickets. Foliage turns orange and red in autumn. The specific name means “circular” or “rounded.” Browsed by elk and mountain-beavers.

#### INTRODUCED MAPLES

Maples introduced from other areas are frequently seen in parks and along streets. Prominent among these are Norway (*A. platanooides* L.) and Sycamore (*A. pseudoplatanus* L.), maples of European origin, and Silver (*A. saccharinum* L.) and Red (*A. rubrum* L.), maples native to e. N. America. See chart opposite Pl. 15.





## TREES WITH OPPOSITE SIMPLE LEAVES TOOTHED OR WAVY-EDGED (PLATE 16)

Only six trees in the West regularly have this type of foliage. In addition, Pacific Dogwood (Pl. 17) occasionally may have leaves that are either fine-toothed or wavy-edged. Also Camphortree (Pl. 30), Cascara Buckthorn (Pl. 43), and California Buckthorn (Pl. 45) may have some leaves opposite.

### WAVYLEAF SILKTASSEL

PL. 16

*Garrya elliptica* Dougl. ex Lindl.

A shrub or small tree of coastal Ore. and Calif. whose broad *evergreen* leaves have distinctive *undulating* edges. Leaves 3–5 in. long, *leathery*, generally egg-shaped, thickly *woolly* beneath. Twigs gray-brown, 4-angled or *4-lined* (use lens), usually hairy; buds with 2–4 scales; leaf scars narrow; bundle scars 3. Flowers small, in drooping 3–6-in. catkins, Jan.–March. Fruits rounded, *white-hairy*, dry berries, in dense 3–6-in. catkins June–Aug. Height to 20 ft. Mountain slopes to 2000 ft. elevation. **SIMILAR SPECIES:** Five shrubby silktassels also occur in Calif., but their foliage is hairless or slightly woolly with leaf edges not strongly undulant. (1) Western Burningbush, (2) Two-petal Ash (Pl. 12), (3) Lowell Ash (Pl. 12), and (4) Singleleaf Ash also have 4-angled twigs, but none is evergreen or has leathery, wavy-edged foliage. **REMARKS:** Named for Nicholas Garry of the early 19th-century Hudson's Bay Co.

### WESTERN BURNINGBUSH

SEE PL. 16

*Euonymus occidentalis* Nutt. ex Torr.

Also a shrub or small tree of the coastal ranges. Leaves 2–4 in., neither leathery nor evergreen, fine-toothed, hairless, and mostly pointed at *both* ends. Twigs *green*, 4-angled or *4-lined* (use lens); buds scaly; bundle scar 1. Flowers brown-purple, few per cluster, on long branched stems, April–June. Fruits *red*, berrylike, beneath woody, 3–5-parted bracts. Height to 20 ft. Mountain slopes and canyons to 6000 ft. elevation. **SIMILAR SPECIES:** No other western tree has opposite simple leaves and green, 4-angled twigs. See Wavyleaf Silktassel. **REMARKS:** Also sometimes called Western Wahoo.





*Lyonothamnus floribundus* Gray var. *floribundus*

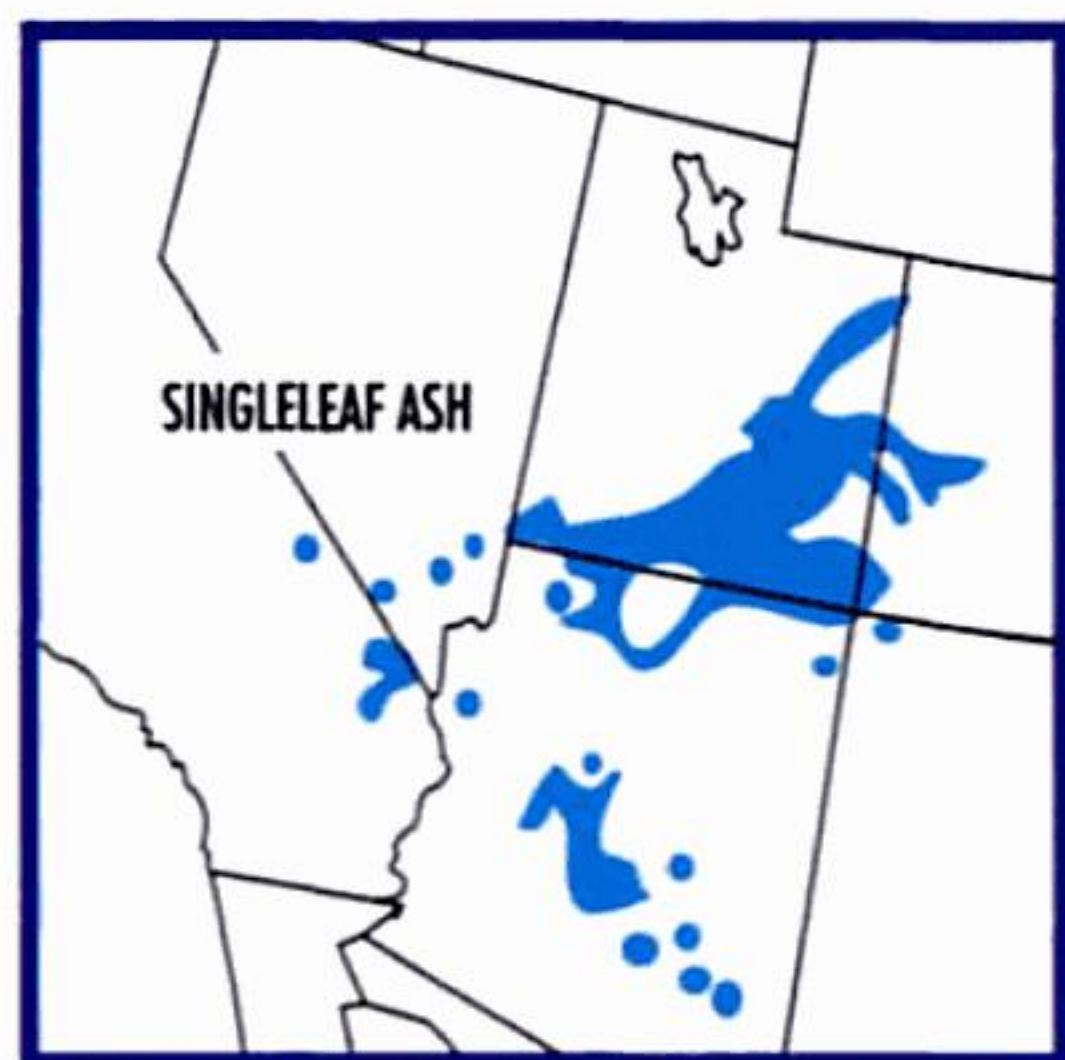
A simple-leaved form of a unique evergreen species that was described before the compound-leaved variety (Pl. 14) was named. Leaves fine-toothed, wavy-edged, or with small lobes. Native on Santa Catalina I. Also called Catalina Ironwood.

**SINGLELEAF ASH** *Fraxinus anomala* Torr. ex Wats. **PL. 16**

An unusual ash distributed near watercourses in the s. Rockies, s. Great Basin, and cen. Ariz. areas. Unlike other ashes, the leaves are mostly simple (occasionally compound with 2–3 leaflets, or mixed). Leaves 2–3 in. long, deciduous, hairless, often almost *circular*, and with blunt teeth or none. Twigs pale brown, 4-angled or 4-lined (use lens); bundle scars many, often indistinct. Flowers tiny, greenish, without petals, clustered at the leaf angles, spring. Fruits dry, papery, winged to the seed base,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; seed flattened. Height to 20 ft. Mountain slopes, 2000–6000 ft. elevations south to nw. Mexico. **SIMILAR SPECIES:** In Ariz., (1) Lowell Ash (Pl. 12), also with 4-lined twigs, has leaflets 5–7 and fruits  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. long. (2) Velvet Ash (Pl. 12) occasionally may have simple leaves, usually along with compound ones, but on rounded unlined twigs. See (3) Wavyleaf Silktassel. **REMARKS:** The specific name points out that the species is indeed an anomaly among its compound-leaved relatives. Common in Zion and Grand Canyon national parks.

**NANNYBERRY** *Viburnum lentago* L. **PL. 16**

A species of the ne. U.S. whose distribution westward extends to se. Sask. and locally to the Black Hills, S.D., region. Leaves 2–5 in. long, *hairless* or nearly so, fine-toothed, and short- to *long-pointed*. Leafstalks *winged*. Buds brown or gray, *long, slender*,





with 2 rough-granular scales. Buds of two sizes, the flower buds larger. Flowers small, white, in flat-topped clusters at the twig tips, May–June. Fruits fleshy, blue-black with one *flat* seed, Aug.–Sept. Height 9–18 (30) ft.; diameter 1–3 (10) in. Woods and thickets. **SIMILAR SPECIES:** No other western tree in its area has both paired, slender, 2-scaled buds and long-pointed leaves. Dogwoods (Pl. 17) mostly have leaves not toothed plus raised twig leaf scars and a rounded seed. **REMARKS:** Fruits are consumed by many gamebirds and songbirds as well as by rabbits and squirrels.

## RUSTY BLACKHAW *Viburnum rufidulum* Raf.

PL. 16

A small southeastern U.S. tree ranging west to cen. Okla. and cen. Texas. Leaves 2–4 in. long, elliptic to egg-shaped, sharply fine-toothed, and shiny-surfaced. Leaf undersides (at least midribs), leafstalks, buds, and sometimes twigs densely *red-hairy*. Leafstalks *winged*. Foliage may become somewhat leathery. Buds *short*, 2-scaled; leaf scars narrow; bundle scars 3. Trunk bark dark, divided into *small, squarish blocks*. Flowers and fruits similar to those of Nannyberry but flowers April–May; fruits Sept.–Oct. Height 6–18 (40) ft.; diameter 2–10 (18) in. Woods and thickets. **SIMILAR SPECIES:** Bark is similar to those of (1) Flowering Dogwood, (2) Eastern Persimmon, and (3) Sourgum, but

*Bark of Rusty Blackhaw*





these species occur naturally only eastward from e. Texas. **REMARKS:** Fruits eaten by foxes, bobwhite quail, and several songbirds. Some people enjoy them, too.

## TREES WITH OPPOSITE OR WHORLED SIMPLE LEAVES NOT TOOTHED (PLATE 17)

In any one locality, few species have foliage of this type. Though basically alternate-leaved, Desert-willow (Pl. 39), California Buckthorn (Pl. 45), and Bluegum Eucalyptus (Pl. 46) also may have some leaves opposite and not toothed. The deciduous foliage of Desert-willow is long and slim, while the other two species have leathery evergreen leaves. Devils' Claws (*Pisonia aculeata* L.), an opposite-leaved woody vine with paired thorns, is spreading in the Lower Rio Grande Valley of Texas and sometimes grows treelike.

## DOGWOODS

Of the six native dogwoods that grow to tree size in the West, only Pacific Dogwood displays showy, white, petallike bracts around its springtime blossoms. Flowers of the other species are small, mostly greenish white, and in comparatively inconspicuous clusters. The fleshy fruits are  $\frac{1}{4}$ – $\frac{1}{2}$  in. in diameter, with 1–2 rounded, stony seeds. Dogwoods have curved lateral leaf veins that strongly tend to *follow the leaf edges* toward the leaf tip. Leaves are elliptic to egg-shaped and short- to long-pointed. Twigs are mostly red-purple, buds with 1 pair of scales, twig leaf scars *raised* and often connected by a line, bundle scars 3, and pith white or brown. Viburnums (Pl. 16) have toothed leaves, leaf scars not raised, and dark fruits with 1–2 flat seeds. In winter, see also Western Mountain Maple (Pl. 15).

### PACIFIC DOGWOOD *Cornus nuttallii* Audubon PL. 17

A small to large tree of the Pacific slope and the Sierra Nevada with local populations in cen. Idaho. Like other dogwoods, the flowers themselves are small. In this species, however, the tight flower heads are surrounded by 4–6 large, white or pinkish, showy, *petallike bracts* each 2–3 in. long and usually pointed. Leaves 3–5 in. long, broadly egg-shaped to almost circular, short- to long-pointed. Mostly with 4–6 pairs of side veins and often somewhat hairy beneath. Unlike other dogwoods, some specimens may have leaves raggedly fine-toothed or somewhat wavy-edged. Winter twigs display slender leaf buds and larger flower buds. Pith *brown*. Springtime flowers appear before or with the







leaves, March–May. Fruits *red* or orange, individually stalkless, and in tight heads of 30–40; Sept.–Nov. Stone smooth. Trunk divided into small squares. Height to 100 ft.; diameter to 2 ft.; usually smaller. Forest edges, to 6000 ft. elevation. **SIMILAR SPECIES:** No other wild western dogwood has such large flower structures or individual fruits without stalks. Within its range, (1) Smooth Dogwood also has brown pith, but leaves are much smaller, with only 3–4 pairs of leaf veins and the twigs/branchlets drooping. (2) Western and (3) Blackfruit dogwoods have white pith. **REMARKS:** Sometimes also flowers Aug.–Sept. Fruits eaten by bandtail pigeons and many other birds; deer browse the twigs. Native Americans are reported to have boiled the bark to make a laxative, while early settlers used the extract in place of quinine where malaria was suspected. Flowering Dogwood (*Cornus florida* L.) of e. N. America, also with showy flowers, is often planted in western parks. It is a smaller species with white pith. Its blossoms, too, usually have only 4 square-ended or notched bracts, each under 2 in. long, while the red fruits are in clusters of 4 (rarely 6–8).

## SMOOTH DOGWOOD *Cornus glabrata* Benth. PL. 17

This small tree or shrub, the only other Pacific slope dogwood with brown pith, occurs in coastal mountains from sw. Ore. to s. Calif. It has the smallest leaves of any western dogwood. These are only 1 ¼–2 ½ in. long, *hairless*, and with only 3–4 pairs of side veins. The brown to red-purple twigs and branchlets often *droop*, frequently taking root where they touch the ground. Flowers small, whitish, in round to nearly flat-topped clusters, *without* bracts, appearing *after* the leaves, May–June. Fruits round, *white*, with stone smooth, Aug.–Sept. Height to 20 ft. Forms thickets on moist sites to 5000 ft. elevation. **SIMILAR SPECIES:** See Pacific Dog-





wood. **REMARKS:** The common name refers to the hairless foliage. Also called Brown Dogwood.

## WESTERN DOGWOOD

PL. 17

*Cornus occidentalis* (Torr. & Gray) Cov.

With foliage similar to Pacific Dogwood, this more shrubby species occupies much the same range but is absent from the Sierra. Leaves 3–5 in. long with 4–7 pairs of side veins, often somewhat *hairy*. Twigs red-purple and  $\pm$  *hairy*, with pith *white* to dark tan and buds slender. Clusters of small blossoms *without* bracts appear with or *after* spring foliage. Fruits *white*; stone *grooved*. Height to 15 ft. Moist soils to 8000 ft. **SIMILAR SPECIES:** (1) Red-osier Dogwood has bright red twigs. (2) Blackfruit Dogwood is found only in n. Calif., where it can be distinguished by smaller leaves and, in season, by the presence of flower bracts and dark mature fruits. **REMARKS:** Fruits eaten by numerous songbirds; mountain beavers gnaw the inner bark. Sometimes regarded as a variety of Red-osier Dogwood.

## BLACKFRUIT DOGWOOD

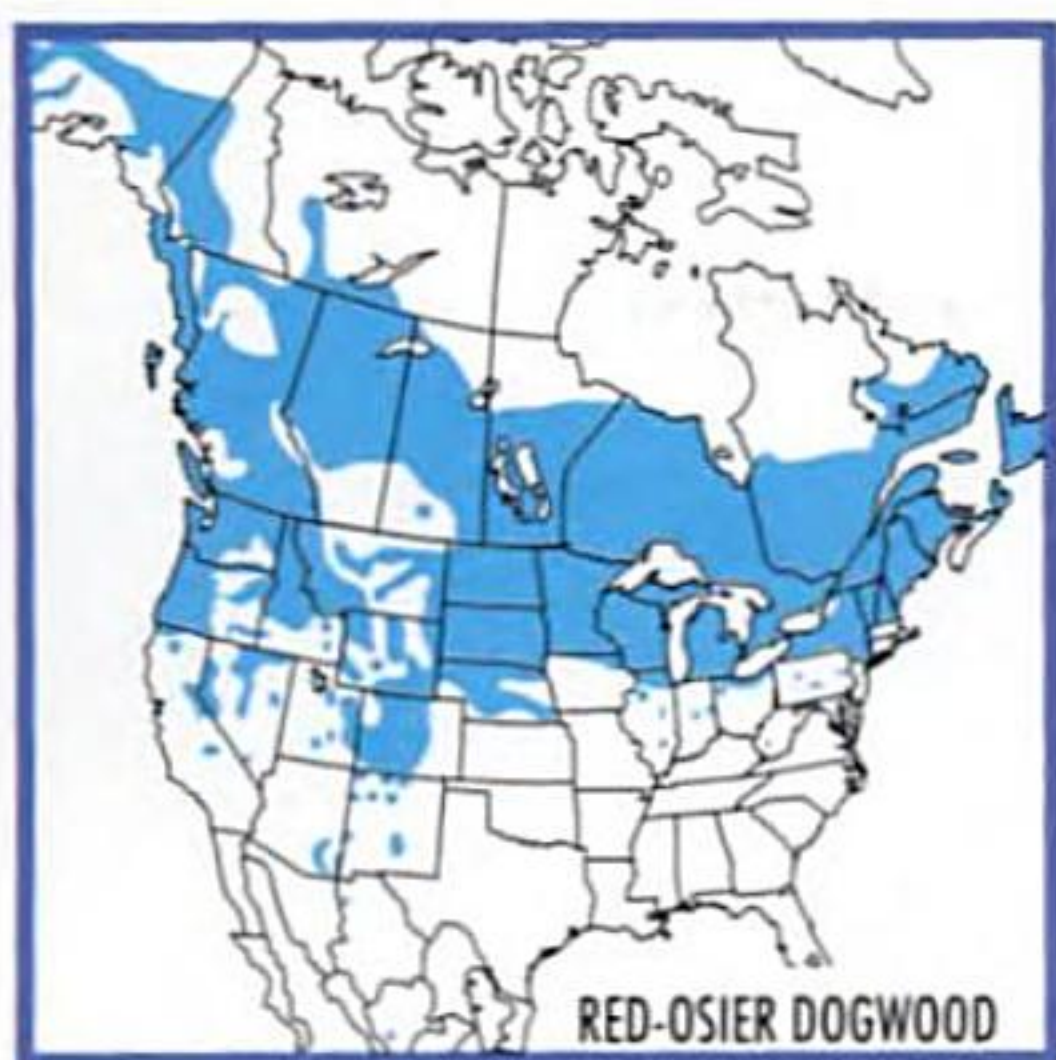
NOT SHOWN

*Cornus sessilis* Torr. & Durand

Found only in n. Calif., this small tree or shrub has bracts beneath the flower clusters like Pacific Dogwood. In this species, though, the bracts are brownish, often with yellow edges. Bracts are *under*  $\frac{1}{2}$  in. long and not impressive. Leaves 2–4 in. long with only 4–5 pairs of side leaf veins. Pith *white*. Flowers small, greenish white, appearing with or *before* the leaves, April. Fruits successively white, yellow, red, and *black* on white-hairy stalks, Aug.–Sept. Height to 15 ft. Stream bank thickets to 5000 ft. elevation. **SIMILAR SPECIES:** See Western Dogwood.







RED-OSIER DOGWOOD



ROUGHLEAF DOGWOOD

**RED-OSIER DOGWOOD** *Cornus stolonifera* Michx. **PL. 17**

Ranging from coast to coast from Alaska, across Canada and the n. U.S., this red-stemmed shrub or (rarely) small tree occurs south to cen. Mexico in scattered mountain localities. Leaves 2–4 in. long, often somewhat hairy, and with 4–7 pairs of side veins. Twigs *bright red* (occasionally green); pith *white*. Flowers *without* bracts, small, white in flat-topped clusters, appearing after the leaves, May–July. Fruits white, July–Sept. or longer; stone smooth. Height to 15 ft. Moist places. **SIMILAR SPECIES:** Western Dogwood has  $\pm$  hairy foliage and grooved seeds. **REMARKS:** Fruits much sought after by songbirds and by ruffed and sharptail grouse. The twigs are eaten by deer, elk, moose, cottontail rabbits, and snowshoe hares.

**ROUGHLEAF DOGWOOD**

**PL. 17**

*Cornus drummondii* C. A. Meyer

This midwestern species ranges west into the plains states from N.D. to s. Texas. Leaves 2–4 in. long, with only 3–4 pairs of side veins. The upper leaf surface usually *sandpapery-rough* with short, stiff hairs and often somewhat long-pointed. Twigs slender and reddish brown. Pith *brown*. Root sprouts common. Flowers small, white, in clusters flat-topped or nearly so, with or *after* the leaves, May–June. Fruits *white*, Aug.–Oct. Height to 15 ft. Forms thickets in moist soils. **SIMILAR SPECIES:** This is the only rough-leaved dogwood and the only one that grows to tree size on the southern Great Plains. **REMARKS:** Fruits eaten by many songbirds and by prairie chickens, sharptail and ruffed grouse, bobwhite quail, and wild turkeys.







## SILVER BUFFALOBERRY

PL. 17

*Shepherdia argentea* (Pursh) Nutt.

The *silver-scaly* twigs, buds, and leaves of this shrub or small tree are distinctive. Leaves  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, somewhat leathery, and wedge-based. Small leaves may be present at the leafstalk bases. Twigs often *thorn-tipped*, bud scales 2, bundle scar single, pith *dark* brown. Flowers small, without petals, greenish, at the leaf angles, April–June. Fruits small, orange to red, berrylike, 1-seeded, July–Sept. Height to 15 ft. Moist sites, mainly northern plains but local throughout much of the West. **SIMILAR SPECIES:** (1) Russian-olive (Pl. 39), widely planted on the prairies as a windbreak and in gardens for ornament, also has silver-scaly foliage, but its leaves are alternate. The opposite-leaved (2) Canada Buffaloberry (*S. canadensis* [L.] Nutt) and the alternate-leaved (3) American Silverberry (*Elaeagnus commutata* Bernh.) have brown and silver scales, but both are shrubs. **REMARKS:** Fruits, sometimes known as soapberries (but see Sapindus, Pl. 24), contain a bitter substance that foams in water. Sharptail grouse and songbirds eat the fruits.

## BUTTONBUSH *Cephalanthus occidentalis* L.

PL. 17

A *wetland* shrub or small tree with leaves often *whorled* in threes and fours, elliptic and short-pointed. Leaves 3–6 in. long, stalks often red. Twigs with side buds *embedded* in bark; bundle scar 1, crescent-shaped; pith brown. Flowers small, white, and tubular, densely clustered in *ball-like* heads at twig ends, May–Aug. Fruits small, dry, brown spheres  $\frac{3}{4}$ –1 in. in diameter, Sept.–Dec. or later. Height to 18 ft. Moist soils, Calif. valleys and along Mexican border to Texas and eastward. **SIMILAR SPECIES:** Dogwoods also may grow on moist sites, but their leaf veins tend to follow the leaf edges. They also have readily evident buds and 3 bundle scars. **REMARKS:** A honey plant. Wilted leaves may poison livestock.





**CRAPEMYRTLE** *Lagerstroemia indica* (L.)**NOT SHOWN**

Not growing wild but sometimes found near old homesites. Leaves *either* alternate or opposite, 2–5 in. long, with *no* teeth, tips blunt or short-pointed, and stalks short or lacking. Evergreen in some areas. Twigs greenish and more or less *4-lined*; pith pale brown or hollow; buds with 2 scales; bundle scar 1. Flowers showy, 1–1 ½ in. wide, pink or white in 3–6-in. end clusters, summer. Fruits dry, brown, ¼-in. capsules splitting into several parts. Trunk with vertical fluted ridges, mottled; bark peeling to leave a smooth yellowish surface. Height to 35 ft. Texas and s. Pacific Coast. **SIMILAR SPECIES:** Trunk bark similar to that of Texas Persimmon (Pl. 46), whose twigs are not 4-lined and whose leaves are sometimes evergreen, under 2 in. long and with rolled edges. **REMARKS:** Introduced from Asia.

**BLACK MANGROVE** *Avicennia germinans* (L.) L. **NOT SHOWN**

Standing in shallows along subtropical coasts of Fla. and La. and again in s. Texas. Numerous short, upright *breather roots* surround the plant. Leaves 2–6 in. long, *thick, leathery*, evergreen, blunt-tipped, wedge-based, with *whitish hairs* beneath, often displaying salt grains on the surface. Twigs *squarish, ringed*, bud scales 2, bundle scar 1, pith white. Wood dark brown to black. Flowers white, fragrant, at twig ends, May–July or longer. Fruits 1 in. long, yellow-green, somewhat egg-shaped but pointed, splitting, germinating while on the tree, Sept.–Oct. or later. Distributed also along both coasts of Mexico and throughout the Caribbean. **SIMILAR SPECIES:** No other mangroves occur in our region. **REMARKS:** Mangrove roots delay water movements and cause sand, silt, and debris to become deposited, extending the shoreline seaward. A good honey plant.








## BROAD-LEAVED TREES WITH ALTERNATE COMPOUND LEAVES PLATES 18-25

Trees with opposite compound leaves are described in Section II (Pls. 11-14). For trees with alternate compound leaves, care must be taken that each of the leaflets is not assumed to be a simple leaf. Also, major leaflets (pinnae) of a twice-compound leaf should not be mistaken for once-compound leaves. Major and minor leaflets attach to herbaceous leafstalks, while compound leaves attach by their leafstalks to woody twigs where buds and/or thorns are present (see Fig. 1). If in doubt whether the foliage of an unknown plant is once- or twice-compound, compare the plates and text in both categories.

When a tree has dropped its leaves, the large size of the leaf scars may sometimes indicate the former presence of compound leaves. Usually, however, the twigs of a leafless unknown plant with alternate leaf scars will have to be compared with the illustrations of both Sections IV and V or identified by means of the Leafless Key in Appendix A.

Tree species with compound leaves are most abundant in the warmer parts of our area. They are grouped as follows:

- |   |  |
|---|--|
| 1. Trees with thorns. 2                   |  |
| 1. Trees thornless. 4                     |  |
| 2. Leaves once-compound.                  | Pl. 18   |
| 2. Leaves twice-compound. 3               |  |
| 3. Thorns in pairs.                       | Pl. 19   |
| 3. Thorns single.                         | Pl. 20   |
| 4. Leaves once-compound. 5                |  |
| 4. Leaves twice-compound.                 | Pl. 25   |
| 5. Leaflets toothed. 6                    |  |
| 5. Leaflets not toothed. 7                |  |
| 6. Leaf scars large.                      | Pl. 21   |
| 6. Leaf scars narrow.                     | Pl. 22   |
| 7. Leaflets under $\frac{3}{8}$ in. wide. | Pl. 23   |
| 7. Leaflets over $\frac{3}{8}$ in. wide.  | Pl. 24  |



## THORNY SOUTHWESTERN TREES WITH ALTERNATE ONCE-COMPOUND LEAVES (PLATE 18)

Throughout geologic time, arid and semi-arid areas have been a principal habitat of large grazing animals. That thorny plants were favored for survival in such an environment may be presumed. In any case, prickly species are often abundant there. Thorns are frequently located at leafstalk bases. Some desert trees may be leafless for months.

The thorny trees on this plate are those with *once-compound* leaves. In addition, Honey Locust (Pl. 20), which has mostly twice-compound foliage, may have *some* once-compound leaves. While Littleleaf Sumac (Pl. 23) has once-compound leaves and is usually thornless, it may have twigs stiff and somewhat thorny. The mesquites and Jerusalem-thorn of Pl. 19, Blue and Texas paloverdes of Pl. 20, and Yellow Paloverde of Pl. 26 are desert trees with transient twice-compound foliage whose major leaflets are joined only at the base and thus easy to mistake for once-compound leaves (see Fig. 1). Care must be taken also that once-compound leaves clustered on spur branches are not mistaken for portions of twice-compound foliage.

Except for the prickly-ashes, the plants on this plate are legumes, members of the pea-bean group. All have three bundle scars.

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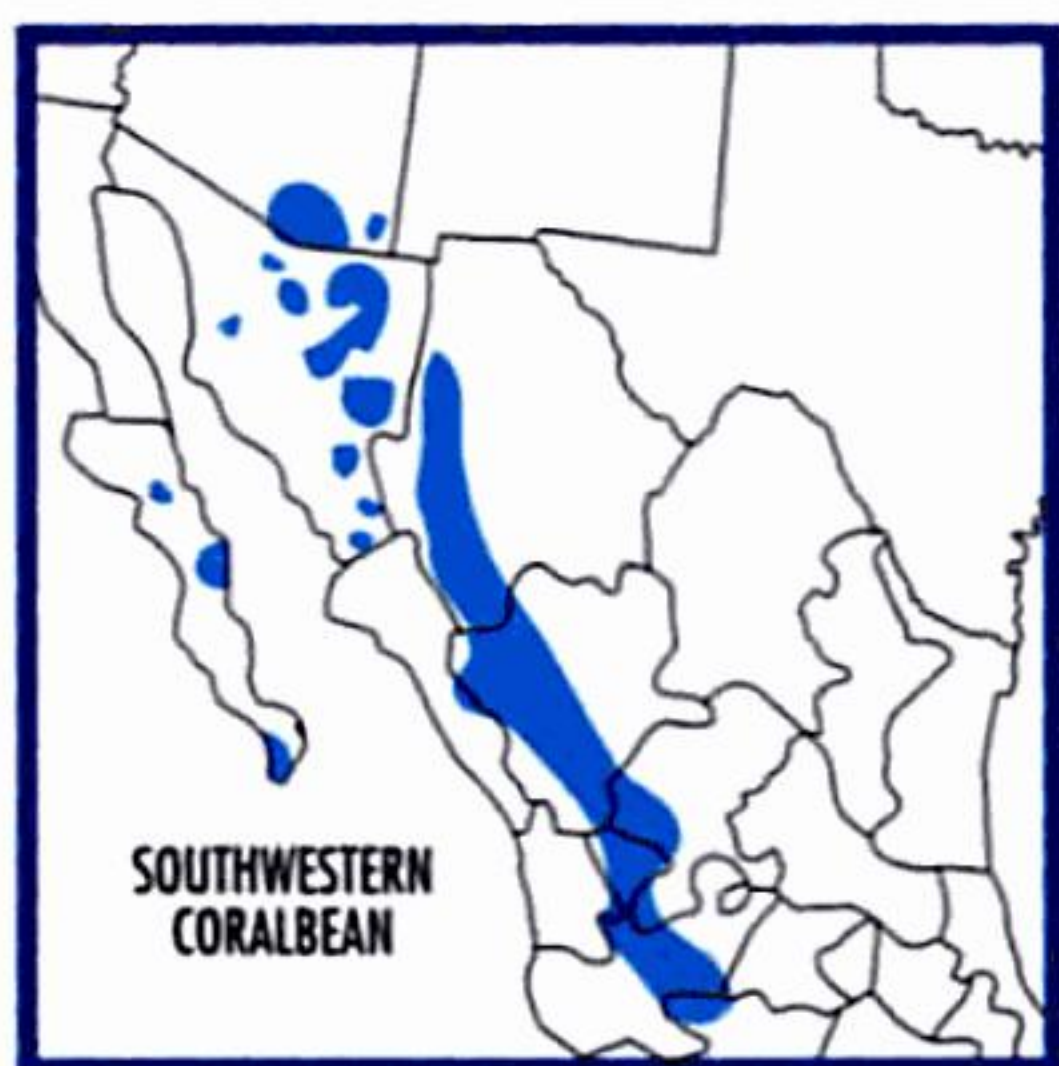
### SOUTHWESTERN CORALBEAN

PL. 18

*Erythrina flabelliformis* Kearney

This southwestern desert species is *leafless* for much of the year but produces a brilliant floral display in spring. Usually shrubby. Leaves 5–12 in. long with *thorny leafstalks* and 3 broad, *triangular*, smooth-edged leaflets, each 2–4 in. long and equally wide. Twigs stout, often *white-hairy*, with small single thorns; branchlets with single or paired  $\frac{1}{8}$ – $\frac{3}{4}$ -in. thorns at the nodes. Trunk light tan. Flowers each 1–2 in. long, *bright red*, in twig-end clusters, appearing before the leaves. Fruit pods 4–10 in. long, leathery, somewhat powdery on the surface, often long-pointed, and usually *constricted* between the several  $\frac{1}{4}$ – $\frac{3}{4}$ -in.-long *scarlet* seeds. Height to 15 ft.; diameter to 10 in. Dry rocky slopes, from mountains of w. Mexico north to s. Ariz. and sw. N.M. **SIMILAR SPECIES:** Distinctive when flowering or in leaf. When leafless, the stout, often white-hairy twigs and light tan bark are identifying characteristics. In s. Texas a shrubby relative, Southeastern Coralbean (*E. herbacea* L.) has somewhat triangular or nearly 3-lobed foliage. **REMARKS:** Tree-size mainly in Mexico. Wood light and sometimes made into corks. Seeds reported to be poisonous but com-



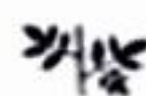


monly strung into necklaces in Mexico. Browse thought to be harmful to livestock. Sensitive to frost. Also known as Chilicote (cheelee-COAT-ay). Mescalbean Sophora (Pl. 24) has red seeds and is sometimes also called Coralbean.

#### DESERT IRONWOOD *Olneya tesota* Gray

PL. 18

A thickly leaved *evergreen* of desert washes and depressions. Leaves 2–4 in. long with dense growth of 8–20 blunt, *gray-green*, fine-hairy leaflets each  $\frac{1}{2}$ – $\frac{3}{4}$  in. long. End leaflet *often lacking*. Leafstalks not thorny. Twigs greenish, hairless; spur branches small; thorns *both* paired and single,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, often curved. Flowers *lavender*,  $\frac{1}{2}$  in. long, pealike, in clusters to 1  $\frac{1}{2}$  in. long, May–June. Fruit pods 1–3 in. long, brownish, hairy, usually with *constrictions* between the 1–6 black seeds. Trunk short with stout branches; bark gray and *shreddy*. Height 25–30 ft.; diameter 1–2 ft. To 2500 ft. elevation. **SIMILAR SPECIES:** Tree presents a more solid mass of gray-green foliage than other species in its desert habitat; conspicuous in bloom. **REMARKS:** The heaviest of all American woods, except for Leadwood (*Krugiodendron ferreum* [Vahl] Urban) of s. Fla. Wood will not float. Dark heartwood is made into highly polished boxes and bowls, even though woodworking tools are dulled by it. It is outstanding for firewood and therefore becoming scarce in many places. Native Americans made arrowheads of the wood. They also ate the dried or roasted seeds and made a bread from the flour. Parts of the plant are eaten by hooded orioles, hummingbirds, deer, bighorn sheep, and horses. Gambel quail favor the plant as a roost site. The intolerance of this species to low temperatures has led to its being regarded as an indicator of climate suitable for citrus plantations. The generic name honors Stephen T. Olney, a Rhode Island naturalist of the 1800s. Also called Tesota (teh-SO-tah) and Palo de Hierro (PAH-lo day-YAIR-oh), the latter a Spanish equivalent of ironwood.



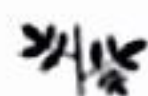


**LIME PRICKLY-ASH** *Zanthoxylum fagara* (L.) Sarg. **PL. 18**

A common shrub or small tree in parts of s. Texas. Leaves 3–4 in. long, with midrib *winged*. The 5–11 leaflets are each  $\frac{1}{4}$ – $1\frac{1}{4}$  in. long, mostly wavy-toothed, with stalks short or absent. Crushed leaves yield a lime- or *lemonlike* scent. Though mostly *evergreen*, the foliage is *not* always leathery. May show gland dots (use lens). Thorns stout, *curved*, about  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, and paired or single. Twigs hairless. Trunk gray, often with thorn-tipped knobs. Flowers tiny and greenish, in *lateral* leaf-angle clusters. Seeds  $\frac{1}{16}$  in., shiny and black, within brownish 2-valved capsules. Height to 15 ft. Rio Grande plains and coastal areas. **SIMILAR SPECIES:** Our only thorny tree with compound leaves whose midribs are winged, and the only western prickly-ash with flower/fruit clusters at the leaf angles. Tenaza (Pl. 19), with thin trunk thorns, has filmy fernlike foliage. **REMARKS:** Found also from Haiti to s. Fla. and ne. Mexico and on Mexico's n.-cen. w. coast including the tip of Baja California Sur. Generic name, sometimes incorrectly spelled *Xanthoxylem*, refers to the yellow wood of some prickly-ashes. Leaves, fruits, or bark often chewed as a toothache cure. Sometimes called Toothache-tree. Also known as Colima (co-LEE-ma). In s. Fla. known as Wild-lime Prickly-ash. Not a true ash (see Pl. 12) but a member of the citrus family.

**TEXAS PRICKLY-ASH** *Zanthoxylum hirsutum* Buckl. **PL. 18**

This small tree or shrub is distributed only in a narrow north-south belt from sw. Okla. through cen. Texas to ne. Mexico. Leaves 2–4 in. long and nearly *evergreen*, with 3–7 (usually 5) blunt, *wavy-toothed*, and *leathery* leaflets. Leaflets  $\frac{1}{2}$ – $1\frac{1}{2}$  in. long, undulantly *crinkled*, somewhat hairy, and with a *lemonlike* odor when crushed. Leaflets short-stalked except for the end one. Leafstalks reddish, hairy, and often *thorny*. Twigs greenish, hairy.





Thorns curved, single,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long. Trunk bark smooth, grayish. *Trunk thorns* up to 1 in. long may be present. Flowers small, greenish, in  $\frac{1}{2}$ –2-in. loose branched clusters at the twig ends. Fruits  $\frac{1}{8}$ – $\frac{1}{4}$  in., brown, gland-dotted capsules that split to show a shiny black seed. Height to 15 ft. Dry soils. **SIMILAR SPECIES:** (1) Lime Prickly-ash has winged leafstalks plus flowers and fruits in the leaf angles. (2) Southern Prickly-ash has leaflets not crinkled and trunk thorns with a corky base. **REMARKS:** Also known as Tickle-tongue and Toothache-tree. Chewing the leaves is said to alleviate toothache. Sometimes considered to be a variety of Southern Prickly-ash.

## SOUTHERN PRICKLY-ASH

NOT SHOWN

*Zanthoxylum clava-herculis* L.

A small eastern tree whose range extends west to cen. Texas. Leaves 4–16 in. long with 7–17 wavy-toothed, pointed, somewhat leathery, nearly evergreen, usually curved, and *asymmetrical* leaflets, each  $1\frac{1}{2}$ –3 in. long. Foliage with *lemonlike odor* when crushed, often with dark gland dots beneath. Leafstalks mostly thorny. Twigs hairless. Buds small, blunt, dark, hairless. Bundle scars 3. Flower/fruit clusters at twig ends. Trunk smooth and gray, with scattered *corky knobs* often thorn-tipped. Height 10–20 (50) ft.; diameter 4–8 (18) in. Poor soils. **SIMILAR SPECIES:** Texas Prickly-ash has leaves smaller, leaflets crinkled, and trunk thorns that lack corky bases. **REMARKS:** Hercules-club is an alternate name used also for another eastern species, *Aralia spinosa* L.

## NEW MEXICO LOCUST *Robinia neomexicana* Gray PL. 18

A small tree of mountains from extreme se. Nev. and cen. Colo. to nw. Mexico and w. Texas. Leaves deciduous, 4–10 in. long with 9–21 smooth-edged, short-stalked, and *bristle-tipped* leaflets,





each  $\frac{3}{4}$ –1  $\frac{1}{2}$  in. long and  $\frac{1}{2}$ –1 in. wide. Twigs rusty-hairy or hairless; twigs and/or branchlets with  $\frac{1}{4}$ – $\frac{1}{2}$ -in. *paired* thorns flanking the leaf scars. Hidden hairy buds burst *through* the leaf scars upon enlargement. Small additional buds may be present above the leaf scars. Spur branches lacking. Bundle scars 3. Bark thin, brown. *Sprouts* vigorously from stumps. Flowers attractive, *pink-purple*, fragrant,  $\frac{3}{4}$  in. long, in 2–4-in. clusters drooping from the leaf bases; spring and early summer. Fruit pods 2–6 in. long, flat, and *brown-hairy*; autumn or later. Height to 25 ft.; diameter to 8 in. Forms thickets on moist sites at 4000–8700 ft. elevations. **SIMILAR SPECIES:** Black Locust has white flowers, hairless fruit pods, and leaflets without bristle-tips. When leafless, other trees with paired thorns have spur branches present and a single bud visible above each leaf scar. **REMARKS:** As in many other legumes, atmospheric nitrogen is converted to useful compounds by bacteria held in root nodules. Valuable in erosion control for this reason and because of its sprouting abilities. Trunks make durable fence posts. Deer and cattle eat the foliage and flowers. Seeds eaten by small mammals and by wild turkeys and other game birds. Native Americans, at least formerly, ate the fresh flowers and cooked the pods for food.

#### BLACK LOCUST *Robinia pseudoacacia* L.

PL. 18

This native of the e. U.S. is spreading rapidly in temperate zones around the world. It has been planted widely in the West and now reproduces naturally in many localities there. Leaves 8–14 in. long with 7–19 *blunt-tipped*, short-stalked, and sometimes fine-toothed leaflets, each 1–2 in. long. Twigs *hairless*;  $\frac{1}{4}$ -in. *paired* thorns mostly present at the leaf scars. Hidden buds break through the leaf scars. Flowers *white*, in 4–6-in. clusters. Fruits pods 2–6 in. long and *hairless*. Otherwise as in New Mexico Locust. Height 70–80 (100) ft. and diameter 2–3 (6) ft. in its native range. **SIMILAR SPECIES:** See New Mexico Locust. **REMARKS:** Wood strong and durable in soil; useful for fence posts. Young shoots and bark sometimes poisonous to livestock, but seeds eaten by many birds and by rabbits and deer. Spreading rapidly after introduction into many parts of the world. Yields a good honey.

### SOUTHWESTERN TREES WITH ALTERNATE LEAVES TWICE-COMPOUND AND THORNS PAIRED (PLATE 19)

The several prickly species of this plate and the next, plus the nonthorny trees of Pl. 25, are the only trees of our area with leaves divided into major leaflets which, in turn, are divided into



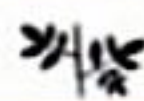


while (3) Texas Ebony has wider ones that are a darker green. Texas Ebony also has larger thorns, only 1–3 major leaflet pairs, flower clusters in the form of slender spikes, and fruit pods that are delayed in splitting. See also (4) Lime Prickly-ash (Pl. 18) and (5) Guajillo (Pl. 20). **REMARKS:** Pronounced ten-AH-za. Reported also to be called Huajillo, pronounced essentially same as Guajillo (Pl. 20); this name is not used where the species occurs. Plants in the genus also are called blackbeads and ape's earrings; the fruits of tropical species are coiled. Browsed by sheep and goats.

**TEXAS EBONY** *Pithecellobium flexicaule* (Benth.) Coult. **PL. 19**

The foliage of this *evergreen* legume is markedly *darker* than its several relatives in s. Texas. Leaves 1½–2 in. long, divided into 1–3 pairs of major leaflets. Each major leaflet with 3–6 pairs of relatively wide minor leaflets. The latter mostly ⅜–¼ in. wide and ⅜–½ in. long. Thorns ¼–½ in. long, trunk thorns lacking. Flowers *white*, in slender fragrant *spikes*; April–June. Fruit pods 4–8 in. long, flat when young, becoming cylindrical and remaining on the tree for some months before splitting open. Height 10–30 (50) ft.; diameter 1–2 ft. Roadsides and thickets, south in e. Mexico to Vera Cruz; also in Yucatan. **SIMILAR SPECIES:** See (1) Tenaza. (2) Blackbrush Acacia (*Acacia rigidula* Benth.), a shrub, has leaflet

*Bark of Texas Ebony*





tips with tiny points. **REMARKS:** Trunks are cut for fence posts. The dark heartwood is used for furniture and ornaments. The seeds are eaten as a nutritious food in Mexico and s. Texas and are also made into jewelry. A good honey species. The bark is reported to contain a yellow dye employed in tanning skins. Also called Ébano (pronounced AY-behn-oh).

## HONEY MESQUITE *Prosopis glandulosa* Torr.

PL. 19

A *deciduous* small tree or shrub with drooping foliage. Common on rangelands throughout much of the Southwest. Leaves 5–10 in. long, mostly with just *one* pair (rarely 2–3 pairs) of major leaflets. Each major leaflet with 10–20 pairs of *narrow*, hairless, minor leaflets  $\frac{3}{4}$ –1  $\frac{1}{2}$  in. long and  $\frac{1}{8}$ – $\frac{1}{4}$  in. wide. Branchlets with *obvious* knobby spur branches, often  $\frac{3}{8}$  in. long, evident even at a moderate distance. Thorns slender, paired (sometimes single), and often 1 in. long. Bundle scars 3. Sapwood yellow; heartwood red-brown. Stumps may *sprout*. Flowers white to *pale yellow*, in slender 2–3-in. spikes, April–July. Fruit pods *cylindrical*, light brown, slightly beaded, 4–10 in. long. Trunk dark, often nearly black. Height to 20 ft.; diameter to 12 in. Grasslands and pastures, from the Great Basin, sw. Okla., and e. Texas into Mexico. **SIMILAR SPECIES:** (1) Velvet and (2) Screwbean mesquites, also mostly with one pair of major leaflets, have short ( $\frac{1}{2}$  in.) minor leaflets. The former species has mostly velvet-hairy foliage; the latter has somewhat hairy leaflets and tightly spiralled fruits only 1–2 in. long. **REMARKS:** In grasslands, mesquites originally were restricted by wildfires and grew mainly along streambeds. Seeds are distributed by livestock and wildlife. With heavy livestock grazing and other fire-control practices, the species has spread widely into pastures. Foliage and twigs are browsed by deer; fruits are eaten by many kinds of wildlife. Excellent for fence posts, char-







coal, and firewood. A fine honey plant. Native Americans ground the seeds into flour for making cakes and a fermented drink. They used the inner bark in basketry and a gummy exudate of the trunk to mend pottery and as a black dye. The name mesquite is believed to have Aztec origins. Commonly pronounced mes-KEET (in Spanish, mes-keetay).

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**VELVET MESQUITE** *Prosopis velutina* Woot. **PL. 19**

Similar to Honey Mesquite and often regarded as a variety of it. A tree of cen. Ariz., sw. N.M., and south into Mexico. The 15–20 pairs of minor leaflets are mostly hairy, only  $\frac{1}{4}$ – $\frac{1}{2}$  in. long and  $\frac{1}{16}$ – $\frac{1}{8}$  in. wide. Thorns sometimes few. Spur branches short. Flowers yellow-green. Height to 50 ft.; diameter to 3 ft. Streambeds and pastures.

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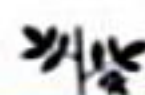
**SCREWBEAN MESQUITE** *Prosopis pubescens* Benth. **PL. 19**

A small, thorny tree with short leaves and unique fruits. Like Honey Mesquite but with both leaves and fruits only 1–2 in. long. Minor leaflets only 5–9 pairs, more or less hairy,  $\frac{1}{4}$ – $\frac{3}{8}$  in. long and  $\frac{1}{8}$ – $\frac{3}{16}$  in. wide. Thorns sometimes slightly curved; spur branches small. Flower spikes pale yellow, about 2 in. long. Height to 20 ft.; diameter to 1 ft. Fruit pods light tan, tightly spiralled. Seeds eaten by Gambel and bobwhite quail, roadrunners, and other birds. Along watercourses, Great Basin to w. Texas and nw. Mexico.

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**JERUSALEM-THORN** *Parkinsonia aculeata* L. **PL. 19**

A thorny *green-barked* shrub or small tree whose 40–60 tiny ( $\frac{1}{8}$ – $\frac{3}{16}$  in. long,  $\frac{1}{32}$ – $\frac{1}{16}$  in. wide) minor leaflets drop early. This





Leaves with 1–3 (usually 2) small major leaflets, each with 1–2 minor leaflets only  $\frac{3}{16}$ – $\frac{1}{4}$  in. long and about  $\frac{1}{8}$  in. wide. Thorns rarely lacking. Flowers yellow, with *red spots* on the largest of the petals, spring. Fruit pods  $\frac{1}{4}$ – $2\frac{1}{2}$  in. long. Height to 25 ft. **REMARKS:** Border Paloverde (*C. macrum* Johnst.) is included here with this species.

**GUAJILLO** *Acacia berlandieri* Benth.

**PL. 20**

A small tree or shrub mostly with single straight or curved thorns  $\frac{1}{8}$ – $\frac{3}{8}$  in. long. Ranging from the lower Rio Grande plains of s. Texas and ne. Mexico to the e. part of w. Texas, this species is unique in having nearly evergreen *fernlike* leaves 4–6 in. long, with 5–12 pairs of major leaflets. Minor leaflets are  $\frac{1}{8}$ – $\frac{3}{16}$  in. long and only about  $\frac{1}{32}$  in. wide, with 30–50 or more pairs per major leaflet. Twigs and branchlets occasionally thornless but usually with thorns  $\frac{1}{32}$ – $\frac{3}{8}$  in. long. Spur branches of medium (under  $\frac{1}{4}$  in.) length. Trunk gray with shallow ridges and scattered gray to black thorns  $\frac{3}{4}$ –1 in. long. Flowers white, in *ball-shaped* clusters about  $\frac{3}{8}$  in. across, Feb.–March. Fruit pods velvety, light brown,  $\frac{1}{2}$ –1 in. wide and 3–6 in. long. Height to 15 ft. Limestone or sandy soils. **SIMILAR SPECIES:** A large-leaved acacia and the only one with more than three major leaflet pairs per leaf or with numerous minor leaflets. The fruits are velvet-hairy and longer than in the several other catclaws. Tenaza (Pl. 19) has 4–6 pairs of major leaflets and paired thorns, while Great Leadtree (Pl. 25) has 14–20 major leaflets and is thornless. **REMARKS:** One of several catclaw acacias. A Mexican name, pronounced wah-HEE-yo. An excellent honey plant. Foliage occasionally poisons sheep and goats. The Mexi-





can-American boundary was explored by Luis Berlandier, a Swiss botanist, in 1828.

## GREGG CATCLAW *Acacia greggii* Gray

PL. 20

The only catclaw that ranges from the Pacific Coast to the Gulf of Mexico. Leaves 1–3 in. long, only *briefly deciduous*, and with 1–3 pairs of major leaflets. Each major leaflet with 3–7 pairs of minor leaflets only  $\frac{1}{8}$ – $\frac{1}{4}$  in. long and  $\frac{1}{16}$  in. wide. Thorns  $\frac{1}{4}$ – $\frac{3}{8}$  in. long, stout, curved, and numerous. Spur branches medium-sized, under  $\frac{1}{4}$  in. long. Flower clusters slim *spikes*, light yellow, fragrant, and 2–3 in. long. Fruit pods hairless, brown, flat but usually *much twisted*, and 2–3 in. in length, with seeds nearly circular. Height 15–30 ft.; diameter 6–12 in. Often forms thickets; arid areas. **SIMILAR SPECIES:** The only catclaw found west of Texas. (1) Guajillo and (2) Roemer Catclaw differ most markedly in having flowers in ball-shaped clusters. Guajillo has narrower minor leaflets and more numerous (5–12) major leaflets. Roemer Catclaw and (3) Wright Catclaw are both like Gregg Catclaw with 1–3 major leaflets, but they have larger minor leaflets and fruit pods not strongly twisted. **REMARKS:** The thorny thickets are widely disliked as obstacles to travel. Drought resistant and heavily browsed by livestock. Native Americans prepared the seeds as a mush. A good honey plant. Eaten by jackrabbits and Gambel quail.

## ROEMER CATCLAW

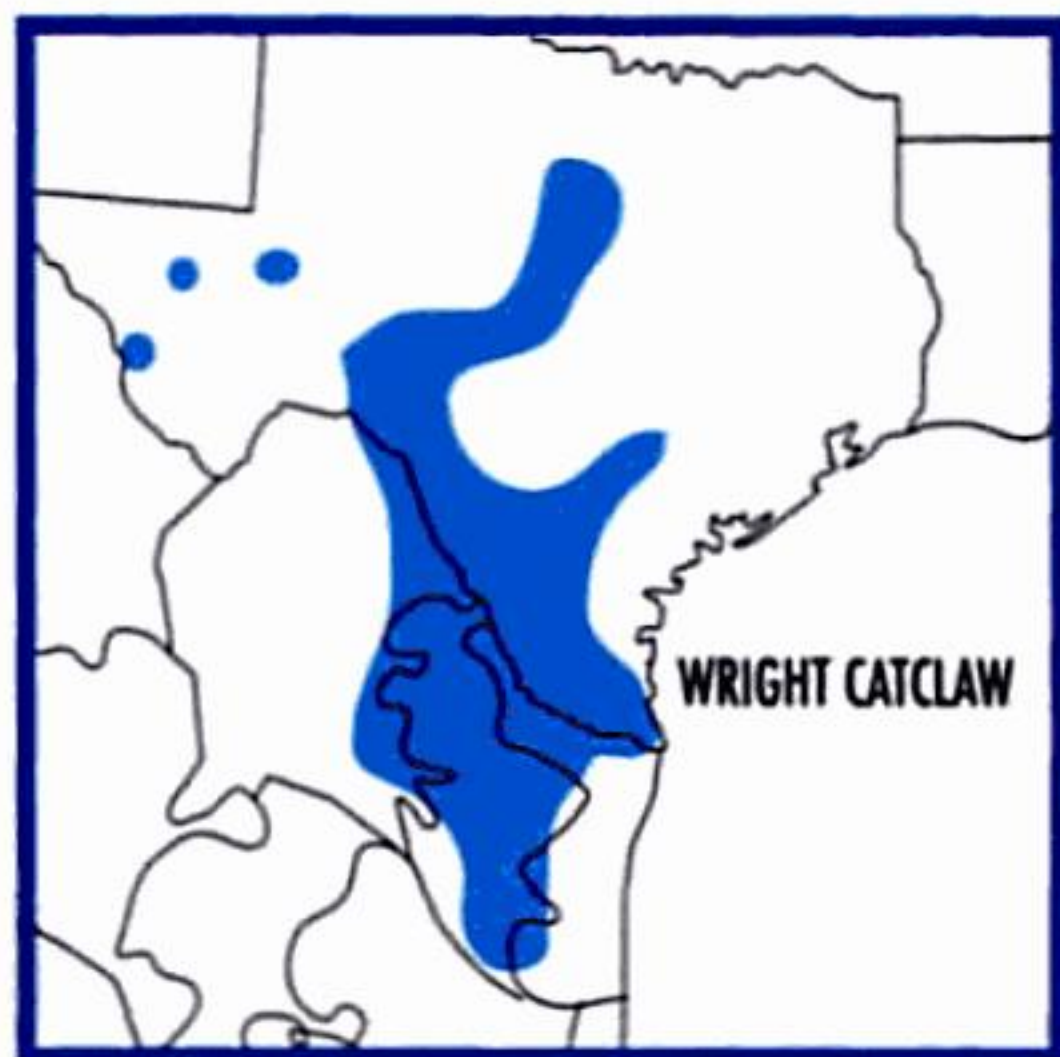
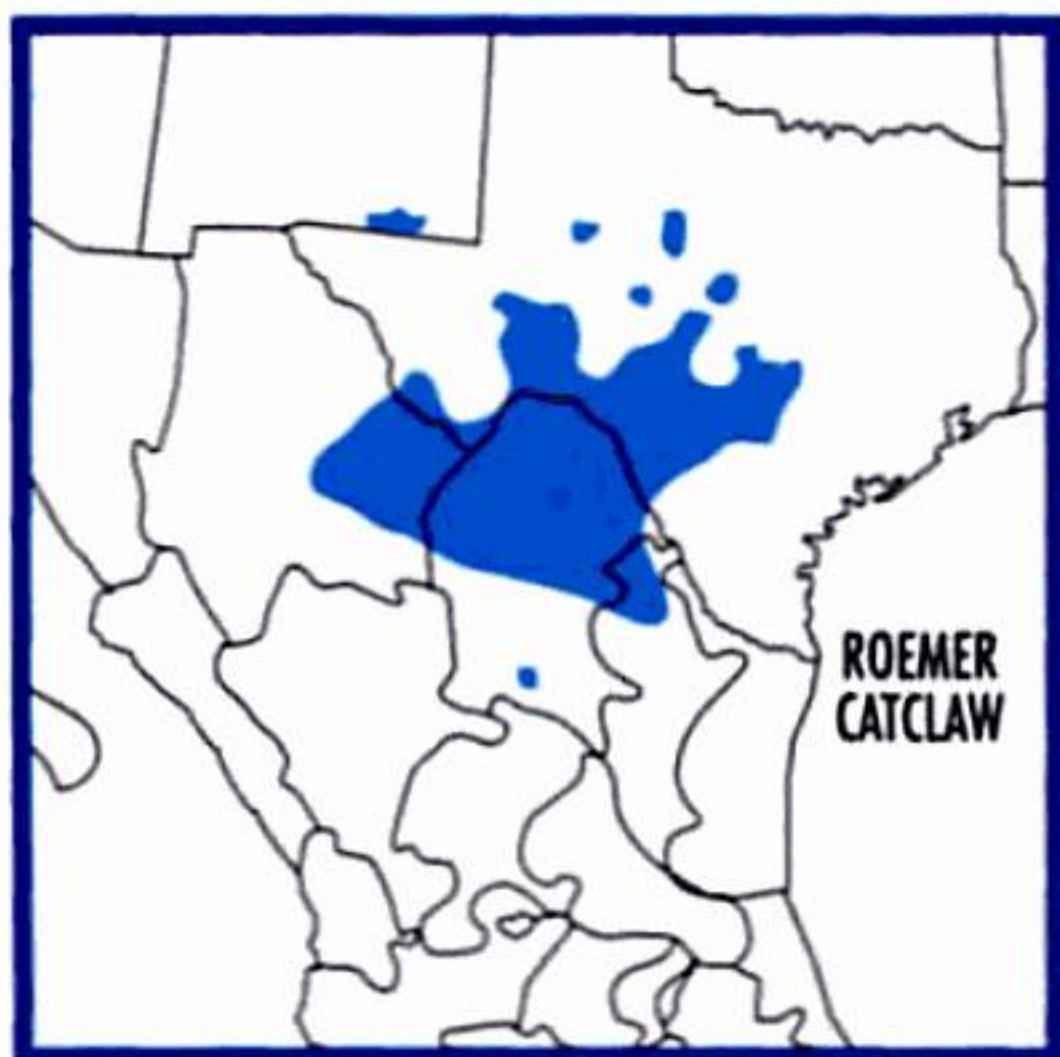
*Acacia roemeriana* Scheele PL. 20

Distributed from se. N.M. through w. and cen. Texas to



*Gregg Catclaw*





ne. Mexico. Like Gregg Catclaw but the leaves are larger ( $1\frac{1}{2}$ –4 in. long) and the 3–8 pairs of minor leaflets are both *longer* ( $\frac{1}{4}$ – $\frac{1}{2}$  in.) and *wider* ( $\frac{1}{8}$ – $\frac{1}{4}$  in.). Thorns under  $\frac{1}{4}$  in. long, some may be paired. Spur branches inconspicuous; blossom clusters globular and whitish yellow, March–May. The dark, hairless fruit pods are 2–4 in. long, with seeds narrowly egg-shaped. Height 6–15 ft.; diameter to 16 in. Shrublands. **SIMILAR SPECIES:** (1) Gregg Catclaw has smaller minor leaflets plus longer and stronger thorns and twisted fruit pods. (2) Wright Catclaw usually has fewer major leaflets. Both Gregg and Wright catclaws have flowers in spikes. **REMARKS:** A valuable honey plant. Foliage consumed by whitetail deer, fruits eaten by scaled quail. Karl Ferdinand Roemer, a German scientist, collected plants in cen. Texas during the 1840s.

#### WRIGHT CATCLAW *Acacia wrightii* Benth.

**PL. 20**

Differs from Roemer Catclaw mainly in that the *yellowish* flowers are in slender *spikes*. Leaves 1–3 in., mainly with only 1–2 pairs of major leaflets. Minor leaflets larger than those of Gregg Catclaw and like those of Roemer Catclaw. Fruit pods 2–3 in. long with seeds narrowly egg-shaped. Height to 30 ft.; diameter to 1 ft. A good honey species. Charles Wright was a 19th-century botanist who collected plants in Texas. W. and cen. Texas to ne. Mexico.

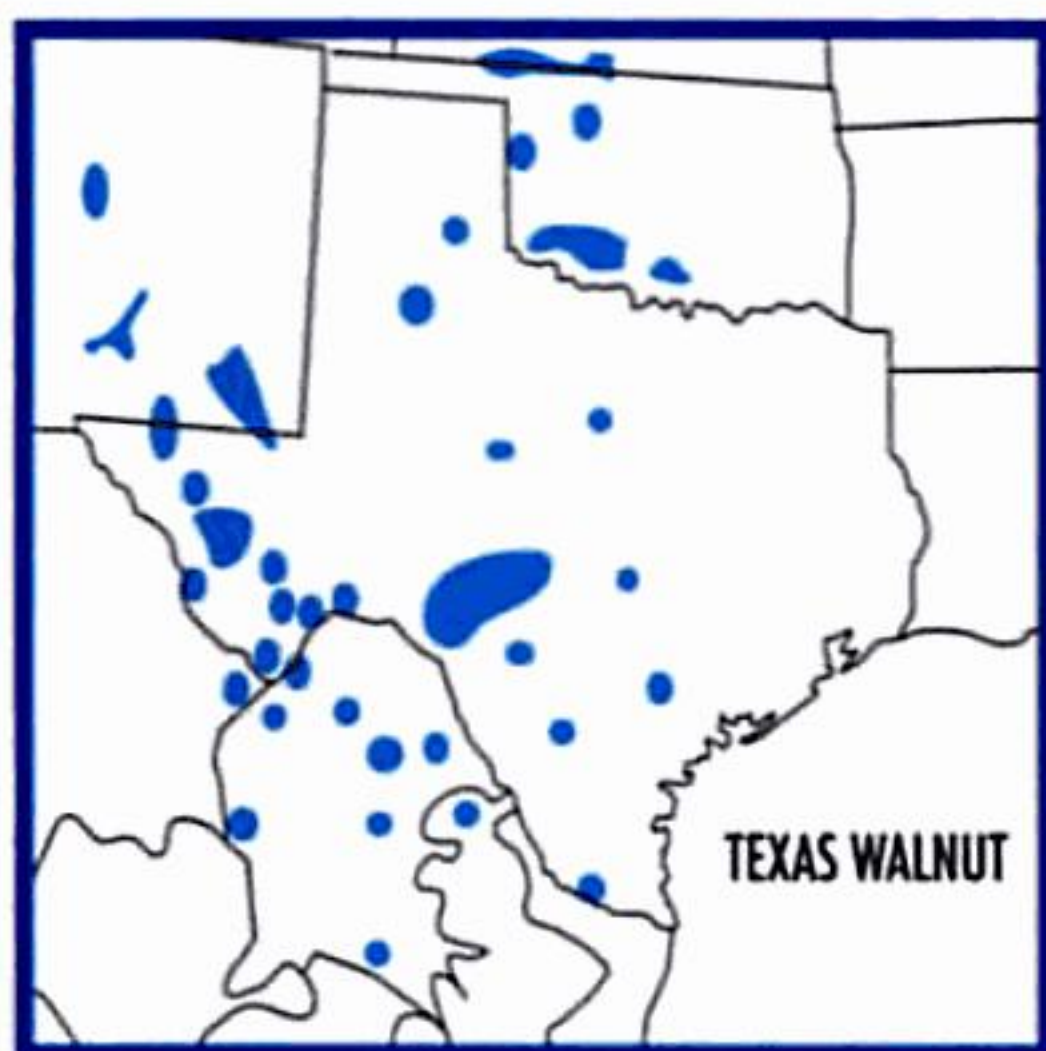
#### DWARF POINCIANA *Caesalpinia pulcherrima* (L.) Sw.

**PL. 20**

Planted widely for ornament in tropical and subtropical regions and spreading to the wild from extreme s. Calif. to s. Texas and s. Fla. Leaves 5–15 in. long with 5–10 pairs of major leaflets and 6–10 minor leaflet pairs. Minor leaflets  $\frac{3}{8}$ – $\frac{3}{4}$  in. long and  $\frac{5}{16}$  in. wide, with *blunt* tips. Evergreen in most areas. Twigs hairless, usually with scattered *straight* thorns  $\frac{1}{4}$ – $\frac{3}{8}$  in. long. Flowers large,







**TEXAS WALNUT** *Juglans microcarpa* Berlandier **PL. 21**

The *narrow, long-pointed*, and numerous leaflets of this species are field marks. Leaves 8–16 in. long with 15–21 (25) leaflets, each 2–6 in. long,  $\frac{1}{4}$ – $\frac{1}{2}$  in. wide, often *curved*, and with *fine teeth* or none. Twigs hairy. Fruits  $\frac{3}{4}$ –1 in. in diameter, with nuts *deeply* grooved. Height to 20 ft.; diameter to 18 in. Along watercourses, sw. Kan. and N.M. to n. Mexico. **SIMILAR SPECIES:** See (1) Arizona Walnut. (2) Black Walnut leaflets are more broad, with the end one often lacking. It also has larger fruits.

**BLACK WALNUT** *Juglans nigra* L. **PL. 21**

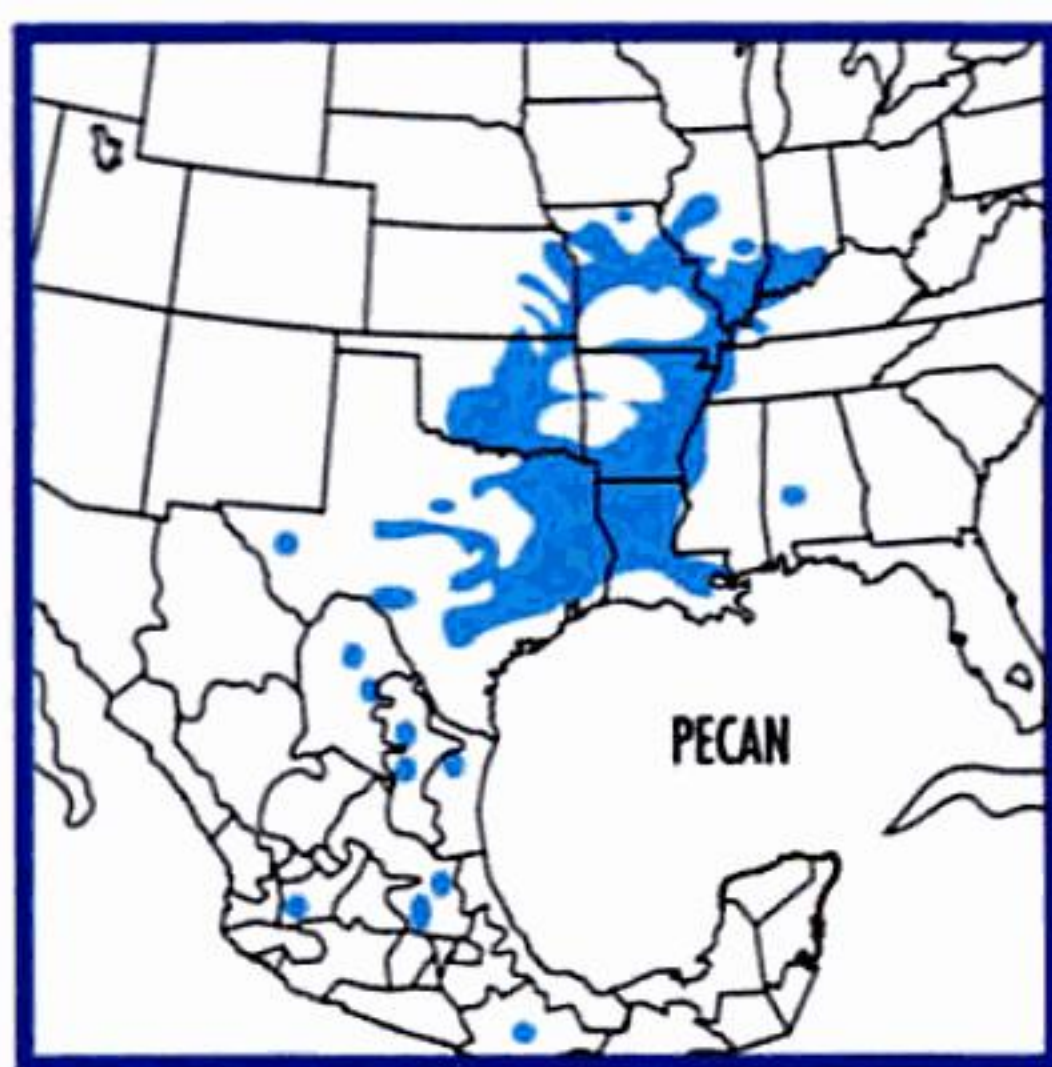
This valuable eastern tree extends its range west locally to the Great Plains from ne. Neb. south to cen. Texas. Leaves 8–24 in. long with 15–23 broad leaflets, each 2–4 in. long,  $\frac{3}{4}$ –1  $\frac{1}{2}$  in. wide, and sharply toothed. End leaflet often absent. Twigs mostly hairless. Fruits 1  $\frac{1}{4}$ –2  $\frac{1}{2}$  in. in diameter with the nut deeply grooved. Height in favorable locations to 150 ft. and diameter to 4 ft. Fertile soils. **SIMILAR SPECIES:** See Texas Walnut. **REMARKS:** Black Walnut lumber is heavy, strong, durable, and takes a fine finish. It is in demand for cabinet making and interior finishing. Large roots are often sought for gunstocks. A yellow-brown dye can be made from the husks of walnuts. Toxic substances secreted from the roots are believed to be the reason that tomatoes, apples, and other species often do not survive near large walnut trees.

## HICKORIES

Closely related to walnuts and, like them, with 5–17 fine-toothed, aromatic, and often long-pointed leaflets. The male flowers also occur in springtime catkins. Unlike walnuts, though, the pith is







*solid*, bundle scars are *numerous*, and nut husks *split* into 4 parts upon ripening. Twigs and branchlets tough, difficult to break. Hickory nuts are eaten by humans and many wildlife species. Before the practice was outlawed, people crushed the green nut husks and used them to poison fish for food. The wood has some value for making tool handles, gunstocks, and baskets. It was once the best American wood for making barrel hoops. As fuel, it produces great heat and high-quality charcoal.

#### BLACK HICKORY *Carya texana* Buckl.

PL. 21

This hickory has its distribution centered in the Ozarks region but reaching into ne. Neb. Leaves 8–12 in. long, with 5–7 (usually 7) leaflets 2–6 in. long and 1–2½ in. wide. Twigs/buds generally *rusty-hairy*; bud scales *overlapping*, the outer ones falling early. Fruits 1¼–2 in. long with husks yellow-scaled, ⅛ in. thick, and splitting to the base; nut nearly *globular* and slightly 4-angled with short, abrupt point. Height to 100 ft.; diameter to 3 ft. **SIMILAR SPECIES:** Pecan has twigs hairless plus paired, yellowish bud scales not overlapping.

#### PECAN *Carya illinoensis* (Wang.) K. Koch

PL. 21

An eastern tree found in the West mainly in cen. Texas and sw. Okla. Leaves 12–20 in. long with 9–17 leaflets mostly 3–5 in. long and 1–2 in. wide. Twigs *hairless*; end bud with 2–3 pairs of *yellow-hairy* scales *not* overlapping. Fruits *4-ridged*; nuts thin-shelled, 1½–3 in. long, longer than wide, Sept.–Oct. Height 100–120 (160) ft.; diameter 1–3 (6) ft. Floodplains. **SIMILAR SPECIES:** See Black Hickory. **REMARKS:** Largest of all hickories. One of the few food plants strictly American in origin. A highly valued species cultivated for its delicious nuts. Fruits of orchard varieties have thinner husks and nutshells than those of wild specimens.





Wood is of value for furniture and house construction. Wild turkeys, opossums, ringtails, and javelinas are among animals that eat the nuts.

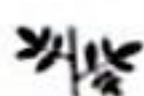
**TREE-OF-HEAVEN** *Ailanthus altissima* (Mill.) Swingle **PL. 21**

A fast-growing small to large tree with leaves 12–24 in. long and having 11–41 leaflets. Leaflets 2–6 in. long,  $\frac{3}{4}$ –2 in. wide, and not toothed *except* for 1–2 pairs of *gland-tipped teeth near bases*. Twigs hairless, yellow-brown, stout, with continuous yellowish pith. Buds small, brown-hairy. Leaf scars *very large*, somewhat triangular, with numerous bundle scars. Flowers small, yellowish, clustered; male blossoms with foul odor, June–July. Fruits dry, 1–2 in. long, narrow, with 1 seed centered in the papery wing, in large pale clusters on the tree, Sept.–winter. Height 80–100 ft.; diameter 1–2 ft. Widespread. **SIMILAR SPECIES:** No other tree has such basal gland-tipped leaflet teeth. In winter, stout twigs, unusually large leaf scars, and numerous bundle scars are distinctive. **REMARKS:** Imported from China by way of England, where it was first planted in 1751. The most rapidly growing woody plant in our area. Will thrive under extremely adverse conditions, growing as much as 8 ft. in a year. Sprouts 12 ft. long are not un-

common where a tree has been cut down. It is so well adapted to disturbed sites that even a crack between the bricks in an alley may provide a seedbed for this plant. Immune to dust and smoke, and may grow to a large size. Though soft, the wood has some lumber and fuel values. The common name is supposed to be of Asiatic or Australian origin, alluding to the tree's height.



*Tree-of-Heaven*





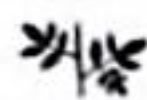
**GREENE MOUNTAIN-ASH** *Sorbus scopulina* Greene **PL. 22**

A widespread shrub or small tree with 11–15 *hairless, long-pointed* leaflets toothed *nearly* to the base. Twigs and buds *hairless*. Flowers  $\frac{3}{8}$  in. across, in clusters 1–3 in. wide, June–July. Fruits red,  $\frac{1}{4}$ – $\frac{3}{8}$  in. in diameter, July–Aug. Rarely to 20 ft. tall; diameter to 4 in. Forest openings. **SIMILAR SPECIES:** See Sitka Mountain-ash. **REMARKS:** The common name honors American botanist Edward L. Greene, who described the species.

**SMOOTH SUMAC** *Rhus glabra* L. **PL. 22**

A small tree or shrub with its principal distribution in the e. U.S. but found also in widely scattered localities throughout the West. Leaves 1–2 ft. long, long-pointed, and with 11–31 *coarse-toothed* leaflets whitish beneath. Twigs *stout*, pithy, *hairless*, and rather *flat-sided*. Sap more or less milky. Buds *hairy*, without scales, and surrounded by U-shaped leaf scars that contain *numerous* bundle scars. Flowers small, in upright, greenish white, cone-shaped clusters, June–July. Fruits each about  $\frac{1}{16}$  in. long, *red-hairy*, in tight pyramid-shaped groups, remaining on the plant for some months. Height 4–25 ft.; diameter 1–4 in. Open sites. **SIMILAR SPECIES:** The large leaves and numerous leaflets are unlike other species of this plate but resemble those of (1) Black Walnut, (2) Pecan, and (3) Tree-of-Heaven (all on Pl. 21). Those species, however, have leaf scars large and shield-shaped plus fruits other than in red-hairy clusters. **REMARKS:** Twigs cropped by deer and cottontail rabbits. Raw sprouts reported to have been eaten by Native Americans. Fruits sometimes made into “lemonade.” Also eaten by ruffed and sharptail grouse, wild turkeys, ringneck pheasants, mourning doves, and many songbirds.

*Smooth Sumac*

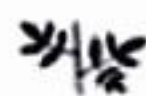
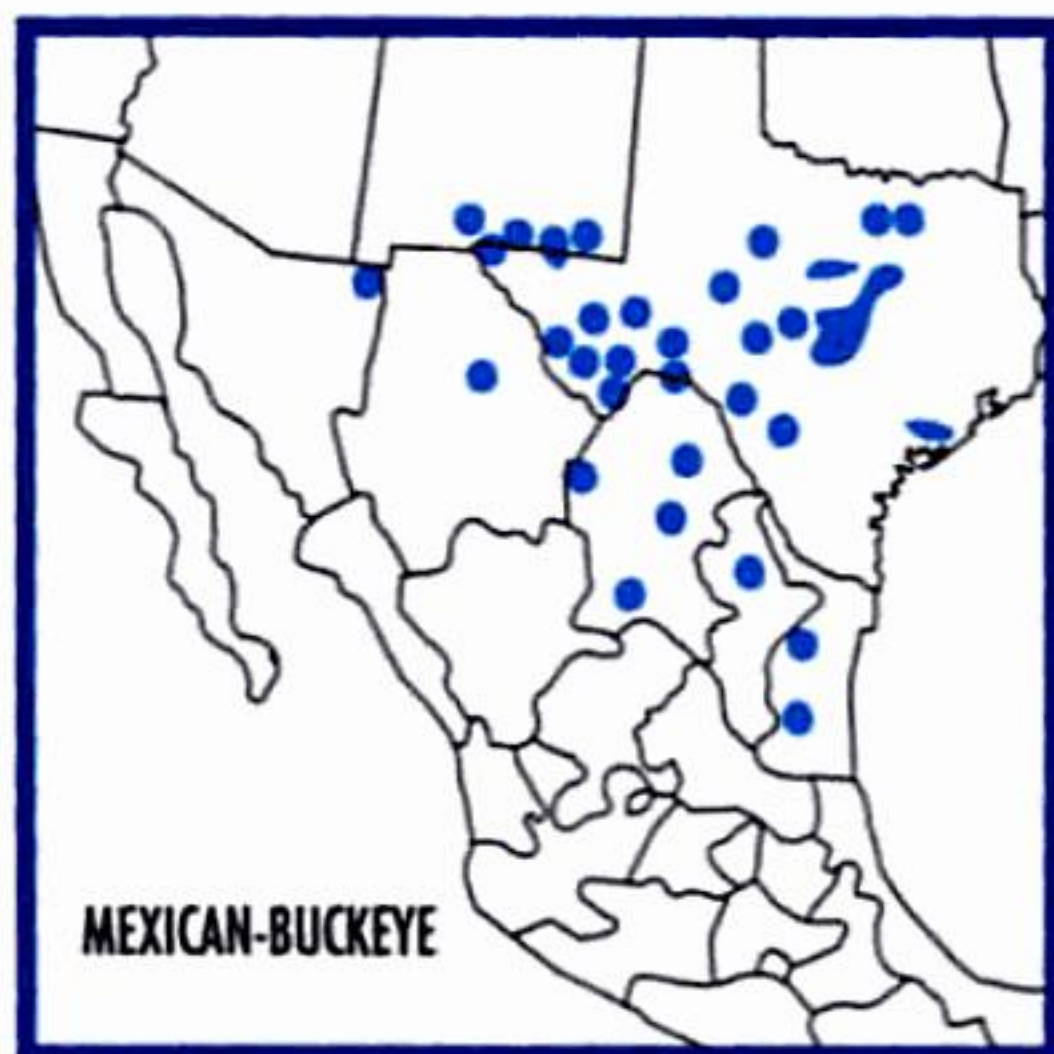




Found only from se. N.M., across cen. Texas and into ne. Mexico. This small tree or shrub has attractive springtime blossoms and unique 3-lobed fruits. Plants usually with *several* stems. Leaves 5–12 in. long, feather-compound with 5–7 somewhat coarse-toothed and long-pointed leaflets. Twigs *slender* and mostly short-hairy; buds dark, blunt; leaf scars 3-lobed with bundle scars *many*, often in three groups. Flowers pink, showy, about 1 in. across, produced from side buds often before the leaves expand. Fruits pear-shaped, dry capsules 1½–2 in. across, splitting into 3 parts to release ¼-in. shiny, round, dark seeds. Height to 30 ft.; diameter to 1 ft. Limestone soils. **SIMILAR SPECIES:** (1) Black Hickory (Pl. 21) has leaves of similar length and leaflet number. That species is not multi-stemmed, however, and its leaflets are more fine-toothed. (2) Smooth Sumac has leaves 12–24 in. long, leaflets 11–31, twigs flat-sided, and fruits small, red. **REMARKS:** Though its several-stemmed growth habit could place it among shrubs, its greater size leads it usually to be called a tree. Though often leafless, its other characteristics cause it to be recommended for wider application in landscaping subtropical areas. The seeds, reportedly poisonous, are said to be used as marbles by w. Texas children. True buckeyes (Pl. 11) have opposite, fan-compound leaves. Also called Monilla (mo-NEE-yah) in Mexico.

## THORNLESS SOUTHWESTERN TREES WITH ALTERNATE ONCE-COMPOUND LEAVES MOSTLY NOT TOOTHED: I (PLATE 23)

Trees with compound leaves are numerous in the southwestern states. This is especially true for species with leaflets not toothed. The plants of this plate have *narrow* leaflets, under ¾ in. wide.





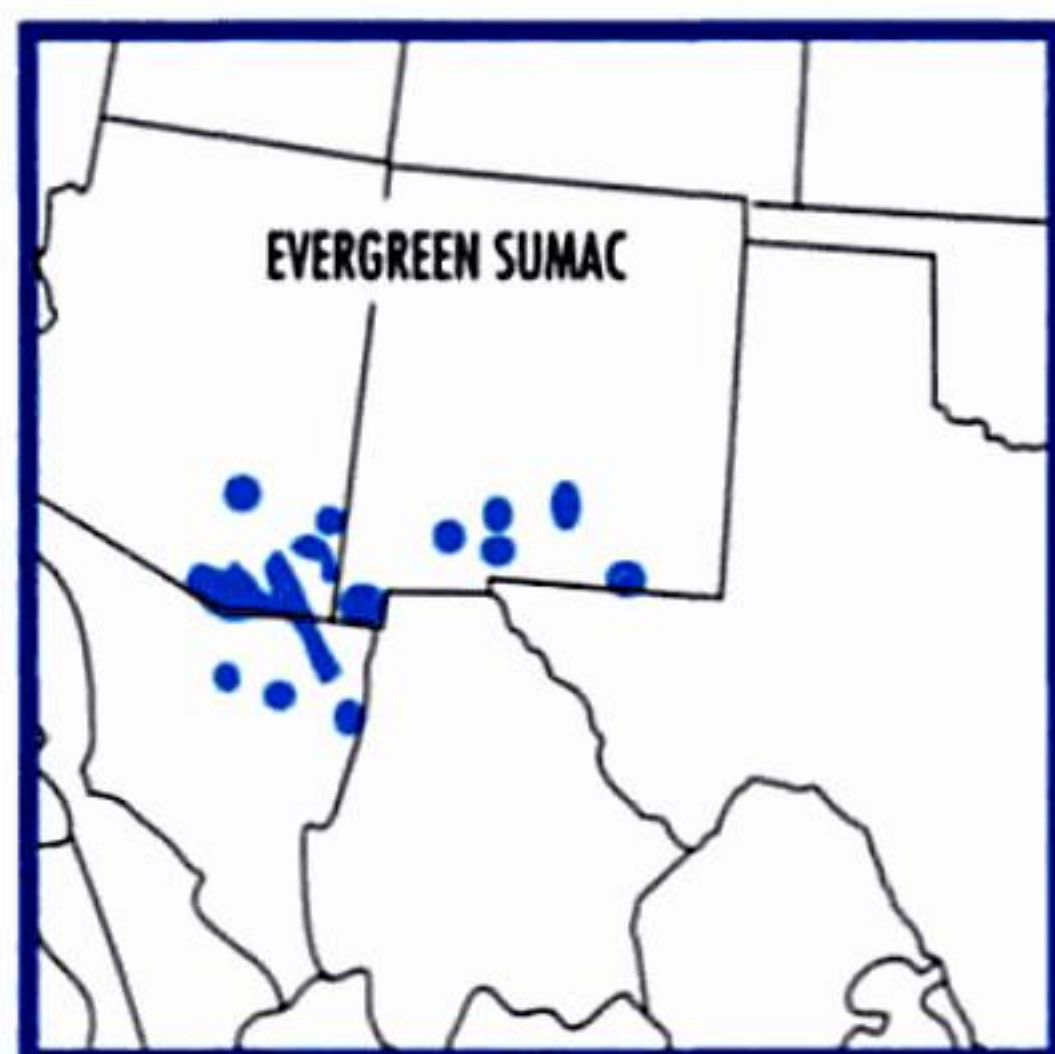
with 13–15 or more round-tipped or short-pointed leaflets  $\frac{3}{4}$ –1  $\frac{1}{2}$  in. long and  $\frac{1}{4}$ – $\frac{5}{8}$  in. wide. Twigs green to brown; bundle scars 3. Buds *hidden*, surrounded by the leafstalk bases or erupting through the raised leaf scars. Trunk bark red-brown, scaly. Flowers white,  $\frac{1}{2}$  in. long, pealike, in 3–5-in. clusters, April–June. Fruit pods *beaded, black*, non-splitting, mostly 2–3 in. long, Sept.–winter. Height 18–20 ft.; diameter 8–10 in. Mostly limestone soils. **SIMILAR SPECIES:** The blunt leaflets of the *Sophoras* are distinctive among plants of this group. Though closely related, (1) Mescalbean Sophora has leathery evergreen foliage. In winter (2) Common Hoptree has evident buds, brown twigs, and a musky odor from crushed twigs.

## MESCALBEAN SOPHORA

PL. 24

*Sophora secundiflora* (Ort.) Lag. ex DC.

A *leathery-leaved evergreen* tree or shrub found mainly from w. to cen. Texas and south to cen. Mexico. Leaves 4–6 in. long with 5–9 *shiny, blunt-tipped* or notched leaflets, each  $\frac{3}{4}$ –2 in. long and  $\frac{1}{2}$ –1 in. wide. Midribs *grooved*. Twigs greenish and sometimes hairy; buds hairy and *visible* in the leaf angles; leaf scars raised; bundle scars 3. Flowers purple, showy, and fragrant, March–April. Fruits stout, *brown*, rather woody, somewhat narrowed between the seeds, often hairy, 1–5 in. long and about  $\frac{3}{4}$  in. wide. Seeds 3–4 (8), large, *red*. **SIMILAR SPECIES:** The shiny, wide, leathery, blunt leaflets are distinctive at all seasons. **REMARKS:** Also called Coralbean, a possible source of confusion with the thorny Southwestern Coralbean (Pl. 18). Often called Mountain-laurel in Texas, though unrelated to *Kalmia latifolia* L. of the e. U.S. The seeds, sometimes made into necklaces, can be poisonous both to people and livestock. Small amounts of powdered seeds, however, also are reported to have been added to mescal and imbibed by





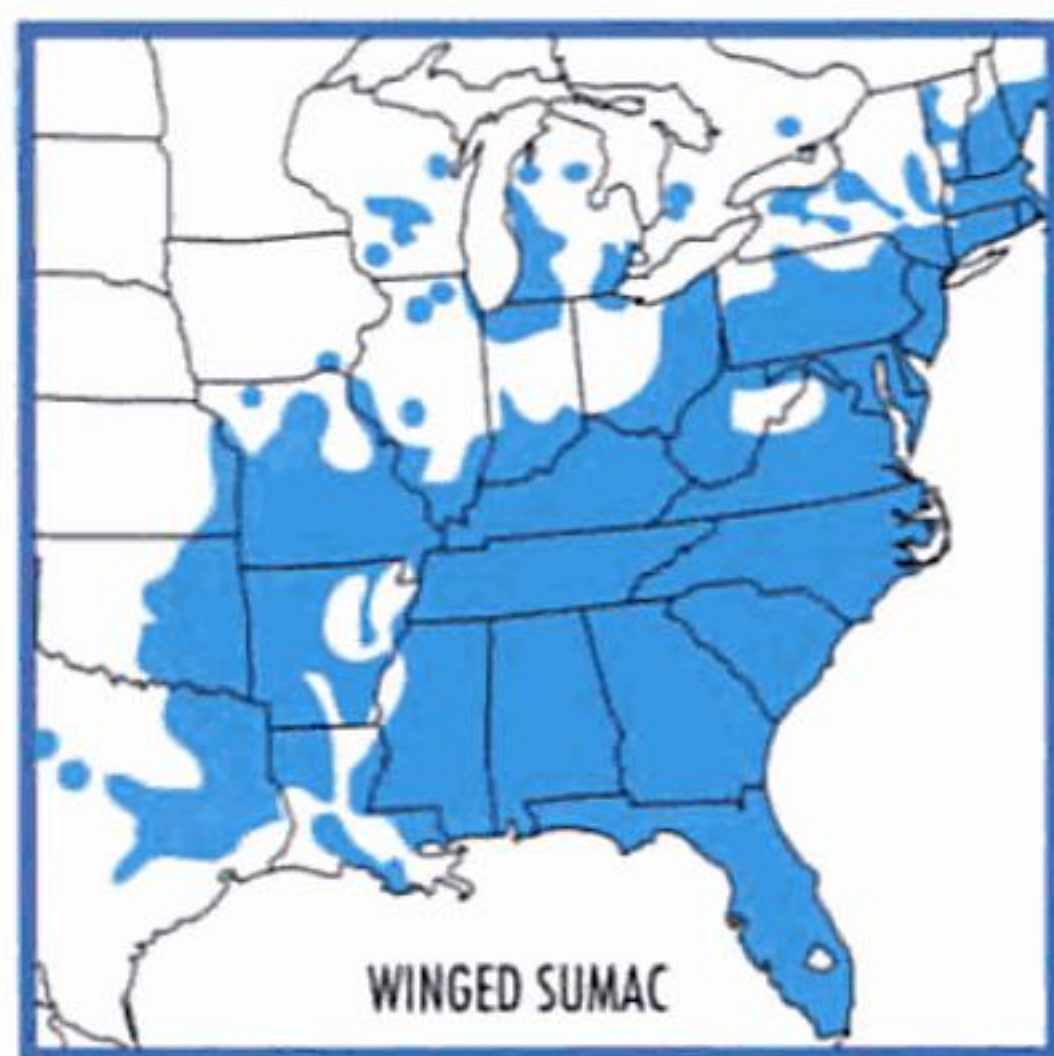
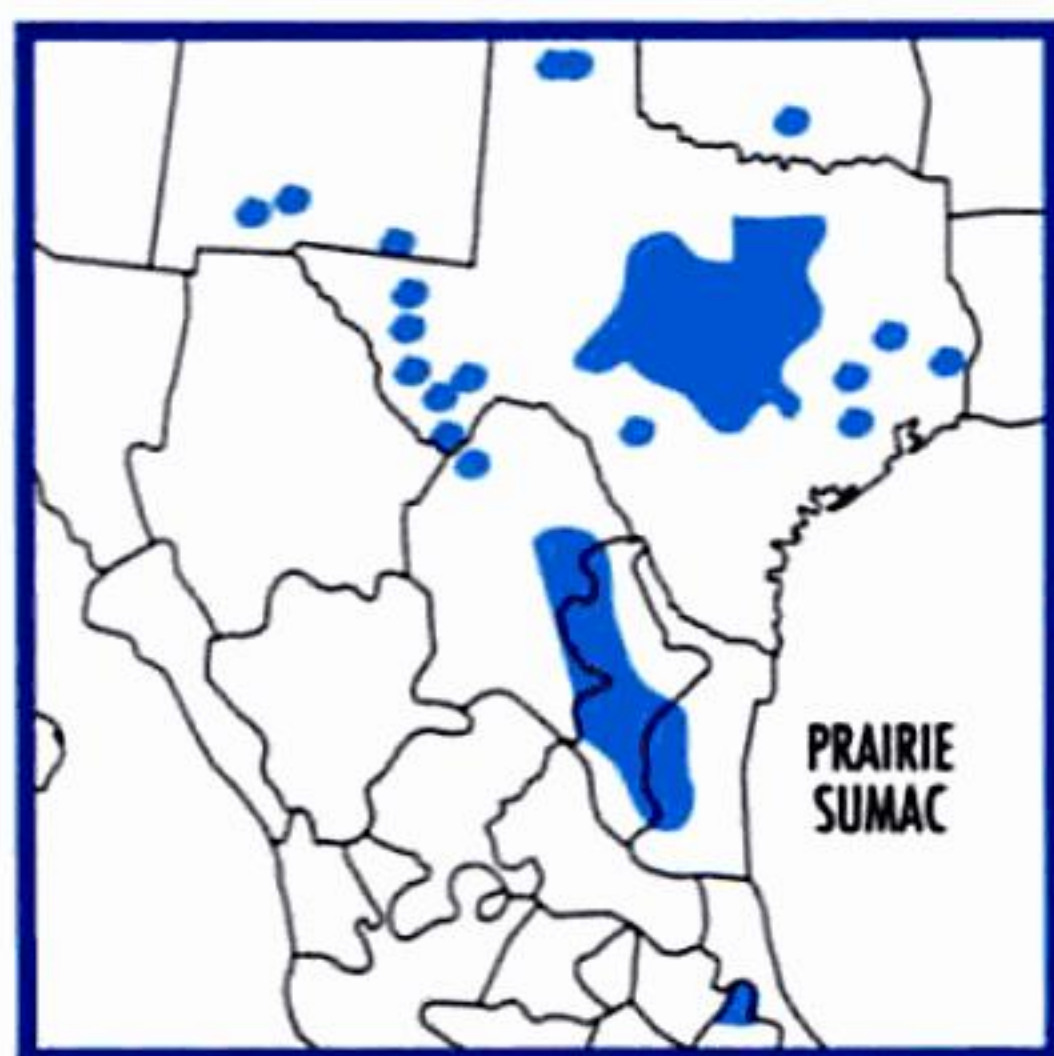
Native Americans during religious ceremonies. Mescal is an intoxicating drink made in desert areas from fermented juices of various century-plant (*Agave*) species.

**EVERGREEN SUMAC** *Rhus choriophylla* Woot. & Standl. **PL. 24**

A small evergreen tree or shrub of scattered localities on both sides of the international boundary from se. Ariz. to w. Texas. Leaves generally 2–3 in. long with 3–7 (usually 3–5) pointed or round-pointed, somewhat *leathery*, shiny, hairless leaflets. Leaflets 1–2 in. long,  $\frac{1}{2}$ – $\frac{7}{8}$  in. wide, end leaflet long-stalked. Midribs *not* winged. Twigs brown or gray, hairless; leaf scars *elliptical*, raised. Flowers white or greenish, in terminal clusters, July–Aug. Fruits *red-hairy*, approx.  $\frac{1}{4}$  in. in diameter, densely clustered. Height to 16 ft. **SIMILAR SPECIES:** Common Hoptree has larger and strictly 3-parted deciduous leaves, the end leaflet short-stalked and much lengthened. It also has U-shaped leaf scars. **REMARKS:** Also known as Mearns Sumac.

**PRAIRIE SUMAC** *Rhus lanceolata* (Gray) Britton **PL. 24**

Local throughout Texas and nearby areas. Leaves 5–10 in. long, divided into 11–23 mostly smooth-edged, *long-pointed* leaflets. Midrib *narrowly* winged (use lens). Leaflets shiny above, pale-hairy beneath, 1–3 in. long, *under*  $\frac{1}{2}$  in. wide, often curved. Twigs *stout*, with large pith, usually hairless. Buds hairy, partly surrounded by leafstalk bases or U-shaped leaf scars. Bundle scars many. End buds false. Flowers small, yellow-green, July–Sept. Fruits *red-hairy*, in dense upright cone-shaped clusters, present much of the year. Height 4–10 (30) ft.; diameter 1–3 (10) in. Dry, rocky soils. **SIMILAR SPECIES:** (1) Western Soapberry lacks winged midribs and has fruits yellow, single-seeded, and fleshy. (2) Com-





leafstalk bases; end bud false. Leaf scars *U-shaped*; bundle scars 3. Crushed leaves and twigs may emit a musky odor. Trunk bark rather smooth, light colored, shallowly grooved. Height 10–20 (25) ft.; diameter 2–10 (16) in. Flowers greenish, small, clustered, with an unpleasant scent, May–July. Fruits *flat, circular*,  $\frac{3}{4}$ –1 in. in diameter, papery, 2-seeded, Sept.–March. From forests of the East to mountain localities of w. Ariz., sw. Utah, and s.-cen. Mexico. **SIMILAR SPECIES:** Small specimens may be mistaken for (1) Poison-oak (*Toxicodendron diversilobium* (Torrey & Gray) Greene), but the end leaflet of that irritating shrub is long-stalked. (2) California Hoptree (Pl. 22) occurs only in that state and has round-toothed foliage. (3) Lemonade Sumac (Pl. 45) occasionally has trifoliate leaves, but these are thick, leathery, and evergreen. See also (4) Evergreen Sumac and (5) Texas Sophora. **REMARKS:** Fruits have been used as a substitute for hops (*Humulus*) in flavoring beer.

## WESTERN SOAPBERRY

*Sapindus drummondii* Hook. & Arn.

PL. 24

Leaves are 4–15 in. long with 8–18 *narrow, long-pointed, somewhat leathery* but deciduous leaflets, each 1–3 in. long and  $\frac{3}{4}$ –1 in. wide. End leaflet usually lacking but, if present, may remain in



*Bark of Western Soapberry*





winter; leaflet halves mostly *unequal*. Twigs greenish gray and often somewhat hairy. Leaf scars triangular or 3-lobed, do not surround buds; bundle scars 3. Buds small, globose, hairy, 2-scaled, and partly embedded (use lens). Bark light gray to dark, scaly. Flowers white, clustered, May–June. Fruits ball-shaped, yellowish to white,  $\frac{3}{8}$ – $\frac{1}{2}$  in. in diameter; Sept.–Oct. or longer. Height 20–50 (75) ft.; diameter 10–18 (24) in. Along watercourses or uplands, w. Ariz. and n. Mexico to Neb. and La. **SIMILAR SPECIES:** See Prairie Sumac. **REMARKS:** Pulp of clustered fruits forms lather in water but may act as a skin irritant yet, in Spanish it's called Jaboncillo (referring to soap). In India, the pounded fruit pulp of a related species is soaked in water and used as a shampoo. Reportedly poisonous if eaten. The buffaloberries (Pl. 17), with opposite silvery foliage, are also sometimes called soapberries.

## BRAZILIAN PEPPERTREE

PL. 24

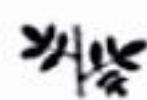
*Schinus terebinthifolia* Raddi

Introduced from the tropics, this ornamental tree is planted widely in warm areas. Leaves *evergreen* and 3–6 in. long with 3–11 leaflets, each  $1\frac{1}{2}$ –3 in. long and  $\frac{3}{4}$ –1 in. wide. Leaflets *leathery* and rounded or short-pointed at the tip, wedge-based, sometimes wavy-toothed, increasing in width toward the leaf tips, and with a turpentine odor when crushed. Midrib *red* and narrowly *winged*. Twigs hairless, *not* drooping. Flowers small, yellow-white, in clusters at the leaf angles, summer. Fruits  $\frac{1}{8}$ – $\frac{3}{16}$  in. in diameter, *red*, 1-seeded, along the twigs, autumn–winter. Height to 20 ft. S. Calif., s. Ariz., and perhaps elsewhere. **SIMILAR SPECIES:** Peru Peppertree (Pl. 23) lacks red midribs and has drooping foliage plus leaflets shorter and less than  $\frac{1}{4}$  in. wide. **REMARKS:** In s. Fla., Brazilian Peppertree is becoming a pest. Spreading vigorously from seeds and cuttings, it is displacing native species there. A popular plant for Christmas decoration.

## SILK-OAK *Grevillea robusta* A. Cunn.

PL. 24

Not proven to reproduce in the wild but an attractive Australian tree planted in s. Calif., Ariz., and s. Fla. Leaves 6–12 in. long, *evergreen*, fernlike, with 3–16 *deeply lobed* leaflets usually white-silky beneath. Leaves sometimes partly twice-compound. Twigs and buds red-hairy; buds without scales. Flowers yellow and red, petals absent, in large clusters. Fruits  $\frac{3}{4}$ –1 $\frac{1}{2}$  in. long, podlike, splitting on one side. Height to 75 ft. Well-drained soils. **SIMILAR SPECIES:** The intricately lobed leaflets are unique. **REMARKS:** To 150 ft. tall and highly regarded as a timber tree in its native land. In this country, often grown as a potted plant.





## THORNLESS SOUTHWESTERN TREES WITH ALTERNATE LEAVES TWICE-COMPOUND (PLATE 25)

All western trees with *twice-compound* leaves, except the introduced Chinaberry, are members of the pea-bean group of plant families. Thorny trees are shown on Pls. 19 and 20. The *thornless* species are on this plate. It should also be considered that some mesquites (Pl. 19) may have few thorns and Dwarf Poinciana (Pl. 20) is not always thorny.

Trees of this plate grow wild mainly in the southern half of Texas. Paradise Poinciana, however, and to a lesser extent Dwarf Poinciana, have escaped from plantings in the Mexican border region west to Calif. Littleleaf Lysiloma is native in s. Ariz.

Leaves large with leaflets either blunt or appearing to be. Except for Chinaberry, leaflets are not toothed, and trees are evergreen or nearly so. Twigs are hairless except for Paradise Poinciana. Flowers are either white or yellow (sometimes red in Dwarf Poinciana) and located at the twig ends. The leadtrees and Littleleaf Lysiloma have small blossoms in globular heads, while those of the poincianas are larger, showy, and in loose clusters. Fruits are flat and mostly hairless pea pods.

The first three species have markedly smaller minor leaflets than the last several.

### GREAT LEADTREE

PL. 25

*Leucaena pulverulenta* (Schlecht.) Benth.

A locally common tree of extreme s. Texas with large, *fernlike* leaves. Leaves 4–10 in. with 14–20 pairs of major leaflets, each with 15–40 pairs of minor leaflets. Minor leaflets only about  $\frac{3}{16}$





## MEXICAN LEADTREE

PL. 25

*Leucaena leucocephala* (Lam.) de Wit

An introduced tree with relatively wide minor leaflets and growing wild in some localities in s. Texas. Leaves 5–12 in. long with 4–8 pairs of major leaflets. Each major leaflet carries 11–18 pairs of minor leaflets  $\frac{3}{8}$ – $\frac{5}{8}$  in. long,  $\frac{1}{8}$ – $\frac{1}{4}$  in. wide, and *pointed*. Minor leaflets are *without* abrupt leaf tip points. Flowers white, in round clusters. Fruit pods 4–6 in. long. Leaves 5–12 in. Height to 25 ft. Moist soils. **SIMILAR SPECIES:** Goldenball Leadtree has yellow blossoms and leaflets with small protruding tips. **REMARKS:** Believed to be native to the Yucatan region of Mexico but now widely established in the tropics. Known merely as Leadtree in s. Fla. Foliage is protein rich and sometimes harvested for livestock feed.

## GOLDENBALL LEADTREE *Leucaena retusa* Benth. PL. 25

A plant of the mountains in w. Texas and n. Mexico and also in the western parts of the Edwards Plateau, cen. Texas. A shrub or small tree whose leaves are 3–8 in. long with only 2–4 (*usually* 3) pairs of major leaflets. Minor leaflets 4–9 (*usually* 3–6) pairs per pinna with each such leaflet  $\frac{1}{2}$ – $\frac{7}{8}$  in. long and  $\frac{3}{8}$ – $\frac{1}{2}$  in. wide. The wide minor leaflets mostly have evident *tiny tips* on the otherwise rounded foliage (use lens). Some leaflets may be notched at the end rather than with extended points. Flowers *yellow* in ball-like clusters,  $\frac{3}{4}$  in. wide, April–Oct. Fruit pods dark, 3–10 in. long. Height to 25 ft., but rarely a tree in the U.S. Canyons. **SIMILAR SPECIES:** No other tree in this group has such leaflet tips or yellow, ball-shaped flower heads. **REMARKS:** Also called Littleleaf Leadtree. The leaves do tend to be shorter and the major leaflets fewer than in our other leadtrees. The minor leaflets, however, are larger.



GOLDENBALL  
LEADTREE



MEXICAN POINCIANA



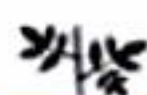


**MEXICAN POINCIANA** *Caesalpinia mexicana* Gray **PL. 25**

Occurring in extreme s. Texas and ne. Mexico, this small tree has leaves 3–7 in. long, with 2–5 major leaflets, each divided into 3–5 pairs of minor leaflets. The minor leaflets are  $\frac{1}{2}$ – $\frac{5}{8}$  in. long,  $\frac{1}{4}$ – $\frac{3}{8}$  in. wide, and *blunt-tipped*. Flowers yellow, showy, in groups of 10 to 30. Fruit pods 1–3 in. Height to 35 ft. Sandy soils. Also w.-cen. Mexico. **SIMILAR SPECIES:** (1) Goldenball Leadtree has tiny leaflet tips. (2) Dwarf Poinciana (Pl. 20) is mostly thorny, has larger leaves with more numerous minor leaflets, and longer bean pods. **REMARKS:** Sometimes cultivated as an ornamental.

**CHINABERRY** *Melia azedarach* L. **NOT SHOWN**

An Oriental tree typically found in dooryards in the se. U.S. west to s. and cen. Texas. It occasionally escapes to the wild. Leaves *deciduous*, 8–16 in. long, with 5–9 major leaflets and 3–7 (9) minor leaflets per major leaflet. Minor leaflets are unlike all other trees in this group, being *large, long-pointed, and coarse-toothed*. They are 1–3 in. long and  $\frac{1}{4}$ –1 in. wide. Twigs dark brown, stout with large leaf scars somewhat 3-lobed and containing 3 groups of bundle scars. Buds small and fuzzy. Flowers purplish, with an unpleasant odor, clustered, petals thin, May–June. Fruits *yellowish, ball-like*,  $\frac{1}{2}$  in. in diameter, usually present, internally *poisonous*. Height to 40 ft. **REMARKS:** Fruits have been used to make flea powder. They are known, too, to have paralyzed livestock and birds when eaten. Their bad taste may account for the few cases of human poisoning. The bark has been used illegally to stun fish.







## BROAD-LEAVED TREES WITH ALTERNATE SIMPLE LEAVES PLATES 26–46

About half of our trees fall in this category. Because so many species have alternate simple leaves, the group is separated into subdivisions. The outline below, which indicates the major characteristics used in dividing the group, may be used as a general guide to identification. A key to leafless plants with alternate leaf scars appears in Appendix A. Crapemyrtle (Pl. 17) has both opposite and alternate leaves. Camphortree (Pl. 30), Desert-willow (Pl. 39), Cascara Buckthorn (Pl. 43), California Buckthorn (Pl. 45), and Bluegum Eucalyptus (Pl. 46) may have some opposite leaves.

- 1. Trees with thorny twigs or branchlets. Pls. 26–28
- 1. Trees without thorns. 2
- 2. Leaves fan-lobed or fan-veined. Pls. 29–31
- 2. Leaves feather-lobed or feather-veined. 3
- 3. End buds clustered, fruits acorns. Oaks Pls. 32–35
- 3. End buds not clustered or, if so, then fruits not acorns. 4
- 4. Buds with a single, smooth, caplike scale; leaves often narrow; bundle scars 3. Willows Pls. 36–38
- 4. Buds with at least 2 scales or none; leaves and bundle scars variable. 5
- 5. Leaves deciduous, mostly toothed. Pls. 39–44
- 5. Leaves evergreen, mostly not toothed. Pls. 45–46

### LEAFLESS DESERT TREES WITH TWIG SPINE-TIPPED BUT OTHERWISE THORNLESS (PLATE 26)

As adaptations to reduce water loss, the leaves of these arid-zone trees are tiny, mostly simple and scalelike, and they *quickly fall*. They are present only briefly, in spring. Twigs and branches are





*greenish* and function like foliage in converting chemical nutrients into living materials.

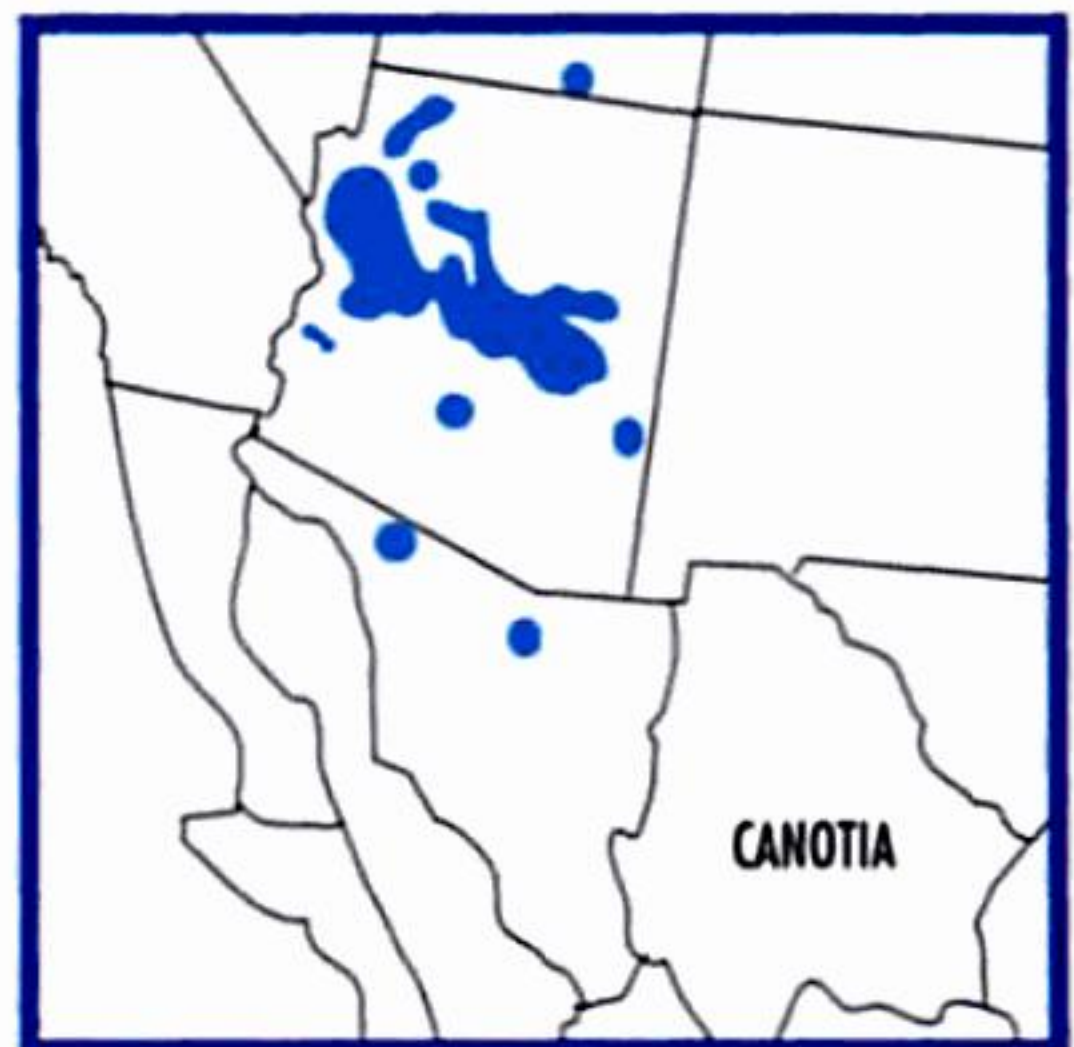
This group is composed of thorny species that have only *spine-tipped* twigs. Related mostly leafless paloverdes with simple side thorns are on Pl. 20. Pls. 27–28 cover the thorny and mostly non-desert trees whose simple alternate leaves are present during much of the year.

Though this section of the book is devoted to species with *simple* leaves, Yellow Paloverde is an exception. With tiny compound leaves, it is included on this plate (as well as on Pl. 20) because its foliage is seldom present and it then resembles the simple-leaved species with thorn-tipped twigs.

**ALLTHORN** *Koeberlinia spinosa* Zucc.

**PL. 26**

A species of n. Mexico that overlaps the international boundary from se. Calif. to s. Texas. Twigs 1–2 in. long, stout, *greenish*, mostly *at right angles* to the branchlets, and tipped with thin *black thorns*. A variety in sw. Ariz., se. Calif., and adjacent Mexico has a more bluish green color as well as twigs longer, more slender, and arranged less regularly at right angles to the branchlets. Leaves only ¼ in. long and drop quickly. Flowers tiny, greenish white, in lateral clusters, May–July. Fruits shiny, black, ¼-in. globular *berries*. Trunk bark *greenish*. Height to 15 ft. Desert plains and slopes to 5000 ft. elevation. **SIMILAR SPECIES:** (1) Yellow Paloverde and (2) Crucifixion-thorn have dry fruits, and twigs not regularly at right angles to the branchlets. **REMARKS:** May form impenetrable thickets. Along with other prickly species, also known as Crucifixion-thorn. The generic name honors C. L. Koeberlin, a 19th-century German amateur botanist. Scaled quail eat the fruits; jackrabbits browse the twigs.







*Crucifixion-thorn*

**CRUCIFIXION-THORN** *Holacantha emoryi* Gray **PL. 26**

A small tree of desert plains and slopes to 2000 ft. elevation. Leaves very small and ephemeral. Twigs *yellow-green*, relatively stout, mostly 3–5 in. long, stiff, and sometimes fine-hairy. Leaf scars tiny, greenish white, scarcely distinguishable. Flowers reddish purple, about  $\frac{1}{4}$  in. across, in dense clusters, June–July. Fruits in *starlike* rings of 5–10 flat, 1-seeded, dry bodies that remain on the plant for several years. Trunk bark greenish. Height to 15 ft. Watercourses and alluvial soils. **SIMILAR SPECIES:** Fruits are the best field mark. In their absence, the dark leaf scars usually present on (1) Canotia and (2) Yellow Paloverde twigs are lacking in this species. (3) Allthorn twigs are mostly only 1–2 in. long. **REMARKS:** Allthorn and Canotia are also frequently called Crucifixion-thorn. The age of fruit clusters often can be told by the degree of weathering. Lt. Col. William H. Emory discovered the species while in charge of the boundary survey after the Mexican war.

**CANOTIA** *Canotia holacantha* Torr. **PL. 26**

The upper Mohave and Arizona deserts between 2000 and 5000 ft. elevation are the principal homes of this species. It ranges from extreme s. Utah through Ariz. to nw. Mexico. Twigs *slender, yellow-green*, 3–5 in. long, forked at *acute* angles and marked with



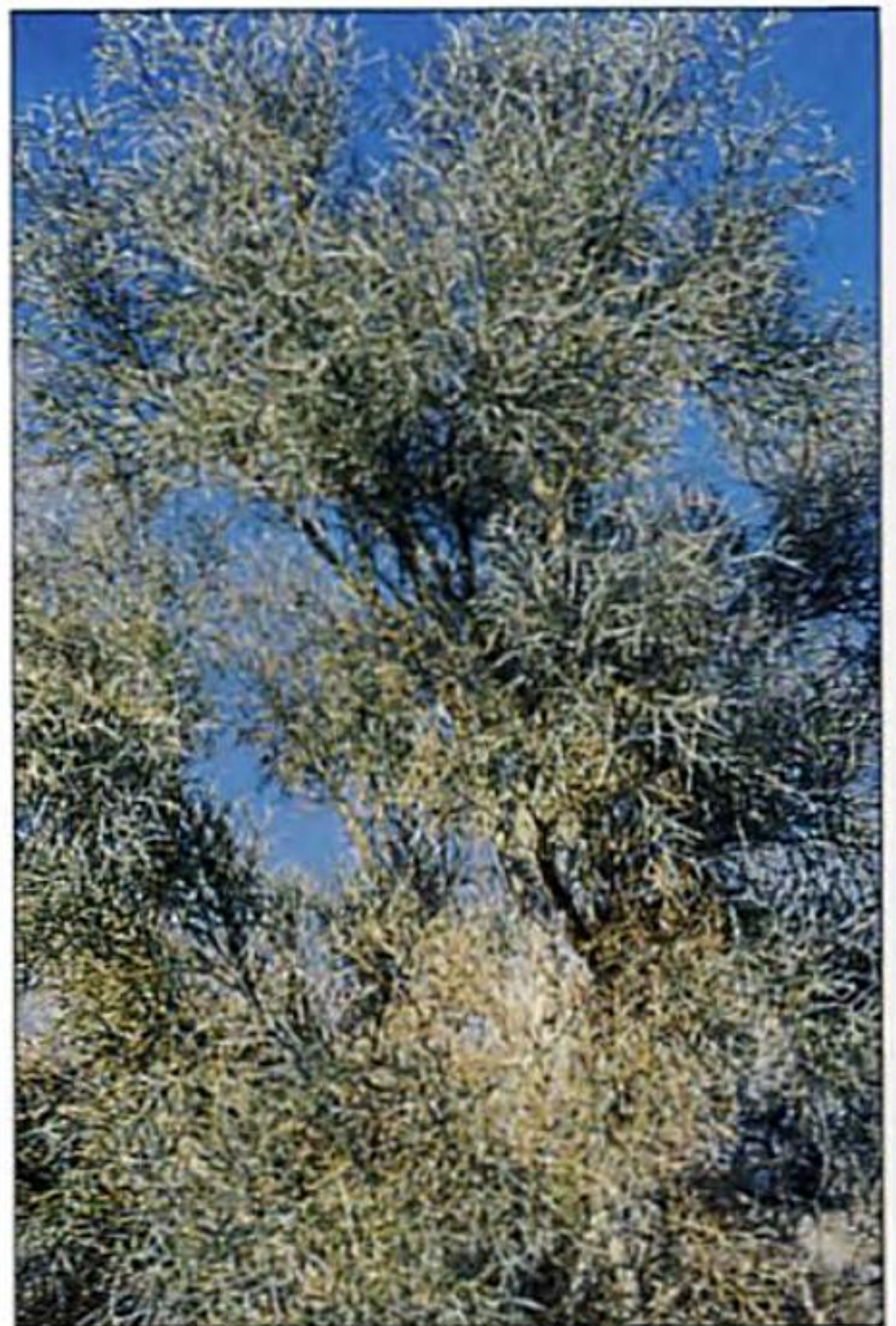


*tiny, blackish*, mostly triangular leaf scars. The twigs also may show very *fine grooves* (use lens), often containing minute white wax particles. Flowers inconspicuous, greenish white, in small lateral clusters, May–Aug. Fruits dry, ½ in. long, 5–10-parted capsules, remaining attached for some time. Trunk bark dark and shreddy; younger bark greenish. Height to 20 ft.; diameter to 1 ft. **SIMILAR SPECIES:** (1) Smokethorn also has slender twigs, but these are gray-green with brownish rather than black tiny leaf scars. In addition, they lack fine lines (use lens). (2) Yellow Paloverde twigs also lack fine grooves. **REMARKS:** Also called Crucifixion-thorn and Paloverde, names that are best reserved for other species.

**SMOKETHORN** *Psoralea arguta* (A. Gray) Barnaby **PL. 26**

Like the paloverdes, this tree is a legume. Unlike them but like the other trees of this plate, the ½-in. leaves are not compound. Twigs slender, densely covered with *very fine whitish hairs* (use lens), giving the plant a smoky appearance. Leaf scars *brownish*. Flowers purple, in small lateral clusters, June. Fruits tiny, 1-seeded pea pods. Trunk bark gray. Height to 25 ft. Desert washes. **SIMILAR SPECIES:** See *Canotia*. **REMARKS:** Conspicuous in blossom. Common in Joshua Tree Nat'l. Park, Calif. where it is called Smoketree (but see p. 358). Formerly in the genus *Dalea*.

*Smokethorn*





*Cercidium microphyllum* (Torr.) Rose & Johnst.

Growing mainly along washes in the Sonoran desert of s. Ariz., se. Calif., and nw. Mexico, the upper trunk and branches are smooth and *yellow-green* (sometimes more green than yellow). Leaves only  $\frac{3}{4}$ –1 in. long with 4–8 pairs of tiny minor leaflets on each of its *single pair* of major leaflets. Twigs 3–6 in. long, moderately stout, *yellowish*, hairless, mostly 2–3 in. in length, and sharp-tipped. Dark leaf scars often sparsely dot the twigs. Flowers  $\frac{3}{8}$ –1 in. across, showy, clustered, pale yellow, with the topmost petal often cream-colored, April–May. Fruits 2–4-in. *pea pods*, constricted between the seeds and with a prolonged tip. Height to 25 ft. Rocky slopes to 4000 ft. elevation. **SIMILAR SPECIES:** (1) Blue Paloverde (Pl. 20) grows in the same area but has blue-green trunk bark, thorns small and lateral, fruit pods flat and shorter. (2) Canotia, also with yellow-green bark, has flexible, fine-grooved twigs (use lens) with tiny flakes of white wax in the grooves. It differs also in having inconspicuous blossoms and 5-parted fruit capsules. **REMARKS:** Conspicuous when in flower. Also known as Foothill Paloverde. Paloverde means “green stick” in Spanish. The generic name is said to be derived from the Greek term for a



*Bark of Yellow Paloverde*





In general, the hawthorns are a widespread group of shrubs or small trees with foliage dense, thorns  $\frac{1}{4}$ –2 in. long, and trunks smooth or scaly. Leaves small and coarse-toothed or shallowly lobed. Leafstalks *without* glands. Twigs hairless. Hawthorn spines are *long and slender*, mostly *without* buds or leaves. They occur on twigs as well as on older wood. Buds nearly spherical; end bud true. Bundle scars 3.

Flowers are small, white, and in twig-end clusters, spring. Fruits are small, red to nearly black, applelike, and mostly with *several* seeds. They often remain on the plants all winter, providing food for numerous birds and mammals, including ringneck pheasant, ruffed and sharptail grouse, gray fox, cottontail rabbit, and whitetail deer.

Apparently because of their density, hawthorns are much used for nesting by many songbirds. They are important honey plants but may become pests in pastures. They were formerly planted for fences in England. The name “haw” comes from the same root as *hedge*. Many varieties are used in landscaping. The species illustrated is Black Hawthorn (*C. douglasii* Lindl.), the most widespread of western hawthorns. **SIMILAR SPECIES:** Some crabapples and plums may have long thorns, but their thorns typically carry buds or leaves.

## NATIVE CRABAPPLES (*Malus* SPECIES, PL. 27)

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Crabapples have sharp leaf teeth, scaly *nonstriped* bark, blunt buds, a true end bud, 3 bundle scars, *no* glands on leafstalks, and *several-seeded* fruits. Often the leaves are somewhat *lobed*. Thorns occur on the older wood, rather than on the twigs, and usually *bear buds* or leaves. Spur branches common.

The following two crabapples are mostly thorny. They are the only native apples in our area. The domesticated apple and pear (Pl. 43) introduced from the Old World do escape to grow wild, however, and could be sharp-twigged. Hybrids between apple species are not rare and usually have intermediate characteristics. Botanists may use either *Malus* or *Pyrus* (and sometimes *Sorbus*) as the name for the genus.

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### OREGON CRABAPPLE *Malus fusca* (Raf.) Schneid. PL. 27

A *coastal* species of the Northwest, extending from s. Alaska to nw. Calif. Leaves 2–3½ in. long, egg-shaped to somewhat triangular, sharp-toothed, often shallowly *lobed* toward the tip, and leaf base U-shaped to square. Foliage usually *hairy*, at least on the midrib beneath. Twigs hairy. Flowers are white, about 1 in.





across, and clustered on spur branches, May–June. Fruits are somewhat *oblong*,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, becoming dark red, Aug.–Sept. Height to 30 ft. Forms thickets. **SIMILAR SPECIES:** Domestic Apple (Pl. 43) may be found where it appears to be wild. The leaves are more or less egg-shaped with many small rounded teeth. **REMARKS:** Oregon Crabapple fruits are eaten by ruffed grouse and by robins and other songbirds.



**PRAIRIE CRABAPPLE** *Malus ioensis* (Wood) Bailey **NOT SHOWN**  
Midwestern but also local on the Edwards Plateau, cen. Texas. Similar to Oregon Crabapple, but twigs and leaf undersurfaces *densely woolly*. Flowers April–May. Fruits green,  $\frac{3}{4}$  in. in diameter, and bitter but make delicious jelly; eaten by many wildlife species. Thickets and open places.

## WILD PLUMS (*Prunus* SPECIES, PL. 27)

Though the cherries, also in the genus *Prunus*, are never spiny, the plums are variously thorny or not. For cherries and usually thornless plums, see Pl. 42.

Some thorns of plums may be simple spines, but most are short, stiff, bud-bearing spur branches with sharpened tips. Thorns are generally present on branchlets and absent from twigs. Leaves are *fine-toothed* and hairless or nearly so. As on other species of *Prunus*, leafstalks or leaf bases of most plums (usually lacking in American Plum) bear small paired glands. The distinctive almond odor of broken twigs is less prominent in plums than in cherries. Unlike the end bud of cherries, that of wild plums is mostly regarded as *false*, though its status is not always easily determined. Bundle scars 3. Flowers white or pink, from lateral buds or spurs, in short clusters of 1–5, with or before the leaves. Wild plum fruits are small and ball-shaped, with *single*, large, and mostly somewhat flattened seeds. Bark often marked with horizontal *linelike* lenticels.

In the West, two rather *round-leaved* plums occur in coastal states while two *pointed-leaved* species extend from the e. U.S. into the plains states.





**KLAMATH PLUM** *Prunus subcordata* Benth.**PL. 27**

On rocky slopes from w. Ore. south to cen. Calif., this species occurs in the coastal ranges and the Sierra Nevada to 6000 ft. elevation. Leaves 1–3 in. long, egg-shaped to nearly round, leaf base often heart-shaped, glands occasional. Twigs usually hairless, with side twigs stubby and/or spine-tipped. Fruits  $\frac{1}{4}$ – $\frac{1}{2}$  in. in diameter, purple, sour, summer. Height to 25 ft. **SIMILAR SPECIES:** (1) Desert Apricot occurs southward and has leaves under 1 in. long. (2) Oregon Crabapple mostly ranges northward. It has several-seeded fruits and leaves that have rounded or square bases. (3) See Bitter Cherry (Pl. 42). **REMARKS:** Fruits may be eaten raw or made into jam and jelly. Deer and domestic sheep browse the twigs and leaves. Also called Sierra Plum.

**DESERT APRICOT** *Prunus fremontii* Wats.**PL. 27**

This arid-land shrub or small tree is found only in two or three of Calif.'s most southern counties and south into the Baja California states of Mexico. Leaves *fine-toothed*, hairless,  $\frac{1}{2}$ –1  $\frac{1}{4}$  in. (mostly under 1 in.) long, often almost *circular*, and veins reddish. Twigs mostly short, stiff, and spine-tipped. Trunk mostly reddish brown, becoming grayer and scaly with age. Flowers white, Feb.–March. Fruits about  $\frac{1}{2}$  in. in diameter, yellowish, *fine-hairy*. Height to 15 ft. Desert scrub and canyons to 4000 ft. elevation. **SIMILAR SPECIES:** No other thorny desert tree has fine-toothed deciduous leaves, but see Remarks on shrubby Spiny Hackberry under Jujube, p. 268. **REMARKS:** Fruits with only a thin layer of edible flesh.

**AMERICAN PLUM** *Prunus americana* Marsh.**PL. 27**

A somewhat *broad-leaved* shrub or small tree of the *northern* plains. Leaves 1–5 in. long, about *half* as wide as long, *dull-sur-*







1-3; June-July. Height to 25 ft. Mountain slopes to 3500 ft. elevation. Range includes the Channel Is., s. Calif. **SIMILAR SPECIES:** (1) Hollyleaf Cherry (Pl. 44) of the coastal ranges has foliage that resembles that of this species. Its leaves, however, are more net-veined, usually larger, and mostly short-pointed. Also, woody thorns are lacking, and its flowers are white, in 2-4-in. slim clusters.

(2) Prickly-leaved oak species (Pls. 33, 34) have clustered end buds, flowers in catkins, and acorn fruits. (3) Desert Apricot foliage is fine-toothed and deciduous. **REMARKS:** Browsed by mule deer and bighorn sheep. See general comments on buckthorns, p. 355.

## JUJUBE *Ziziphus jujuba* Mill.

PL. 27

A native of s. Asia and se. Europe, escaped in states along the Gulf of Mexico west to cen. Texas. Shrub or small tree with  $\frac{1}{4}$ - $\frac{3}{4}$ -in. *paired* thorns at the leafstalk bases. Leaves 1-2½ in. long, *shiny*, egg-shaped, short-pointed or somewhat blunt-tipped, with 3 *main veins* meeting at the leaf base. Twigs hairy, usually *green*; 1 thorn of pair generally much larger; spur branches large; bundle scar 1 or indistinct. Flowers tiny, greenish, March-May. Fruits red-brown at maturity, edible, seed single, July-Nov. Height to 50 ft. Forms thickets. **SIMILAR SPECIES:** Spiny Hackberry (*Celtis pallida* Torr.), a desert shrub also with leaves fan-veined, ranges from s. Ariz. to s. Texas and n. Mexico. It has thorns both single and paired and often at right angles. Its leaves are under 1 in. long and either without teeth or with a few wavy teeth. Bundle scars 3. Fruits dry. **REMARKS:** Sugared fruits are tasty; also known as Chinese Date. Called Granjeno (gron-HAY-no) in Spanish.

## THORNY TREES WITH ALTERNATE SIMPLE LEAVES NOT TOOTHED (PLATE 28)

This distinctive group is mainly southwestern in distribution and marked by *smooth-edged* (occasionally few-toothed) and mostly *small* leaves *rounded* at the tips. They have thorns which, except for Osage-orange, often bear leaves or buds. *Spur branches* with clustered leaves are frequent. The first five species listed tend to have small, fragrant flower clusters. Of these, *Ceanothus* and





*Bark of Greenbark Ceanothus*

*Condalia* species bear stiff, spine-tipped twigs arranged in two planes to form a + when the branch is viewed from its end. The bumelias and Osage-orange have milky sap, apparent in warm weather at least, and usually seen in freshly broken leafstalks and/or twigs (caution: sap causes a rash in some people). Several desert trees of Pl. 26 also fall in this group but for most of the year are entirely leafless. Russian-olive (Pl. 39), with silvery leaves and twigs, may have spines present.

**GREENBARK CEANOTHUS** *Ceanothus spinosus* Nutt. **PL. 28**

Occurring naturally only in sw. Calif. and locally in nearby areas of Mexico, this is the only *Ceanothus* that is both tree-size and thorny. Leaves  $\frac{3}{8}$ –1  $\frac{1}{4}$  in. long, *evergreen*, leathery, blunt-tipped with a *tiny point* (use lens). Foliage pale beneath; three main veins meet at the *U-shaped* leaf base. Sometimes a few teeth near the leaf tip. Side twigs short, stiff, arranged in *two planes* (alternating at right angles), and with *spiny tips*. Flowers small, pale blue or white, in elongate clusters at or near the twig ends, Feb.–May. Fruits dry, black capsules,  $\frac{1}{8}$ – $\frac{1}{4}$  in. across, with several seeds. Trunk bark *olive green*, smooth. Heartwood reddish. Height to 20 ft. A component of chaparral scrub on coastal mountains from San Luis Obispo Co. south to nw. Baja Califor-







nia Norte. **SIMILAR SPECIES:** This is the only thorny tree with simple fan-veined leaves not toothed. The tree-size condalias have leaves feather-veined, leaf bases wedge-shaped, flowers in small dense clusters at the leaf angles, and fruits 1-seeded, fleshy. **REMARKS:** Along with many other *Ceanothus* species, called California-lilac. Also known as Redheart. Since there are several dozen shrubby *Ceanothus* species, many of them thorny, still another common name, Spiny Ceanothus, is not distinctive. Browsed by deer. See remarks on *Ceanothus* species (p. 23).

**BITTER CONDALIA** *Condalia globosa* I. M. Johnst. **PL. 28**

A deciduous tree of desert mountains. *Extremely spiny* with dense tangles of stiff, sharp-ended twigs. Leaves *blunt*, only  $\frac{1}{4}$ – $\frac{1}{2}$  in. long,  $\frac{1}{8}$ – $\frac{3}{16}$  in. wide, *wedge-based*, and usually hairy beneath. Branchlets with short twigs *alternating* at right angles and tipped with needle-sharp *blackish* spines. Flowers tiny, white, single or paired, at the leaf angles, March–April. Fruits black, rounded,  $\frac{1}{8}$ – $\frac{1}{4}$  in. in diameter. Height to 20 ft. Dry soils and near washes, to 2500 ft. elevation. **SIMILAR SPECIES:** Bluewood Condalia has larger leaves and does not range west of Texas. **REMARKS:** Often the home of nesting birds, who apparently find among the thorns both structural support for their nests and protection from predators. Fruits extremely bitter but said to be suitable for jelly. Wood yields a blue dye. Antonio Condal, a Spanish medical doctor, participated in an expedition to S. America in 1754.

**BLUEWOOD CONDALIA** **PL. 28**

*Condalia hookeri* M. C. Johnst.

This condalia occasionally grows to tree size in cen. and s. Texas and in ne. Mexico. Leaves deciduous,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. long,  $\frac{3}{8}$ – $\frac{1}{2}$  in. wide, *wedge-based*, with a *tiny point* projecting from the blunt tip





**SAFFRON-PLUM BUMELIA** *Bumelia celastrina* H.B.K. **PL. 28**

A tree of s. Texas, s. Fla., and the Caribbean. Leaves  $\frac{1}{2}$ –2 in. long, wedge-based, rather leathery, *evergreen*, and without a conspicuous network of small veins. Leaves often clustered on small spurs. Branchlets with stiff, thorn-tipped side twigs. Buds hairy. Sap *milky*. Flowers and fruits much as in Gum Bumelia but fruit more edible. It blooms Oct.–Nov. with fruits maturing April–June. Height to 20 ft.

**LONGLEAF PEPPERTREE**

**NOT SHOWN**

*Schinus longifolius* (Lindl.) Speg.

A small ornamental tree introduced from e.-cen. S. America and naturalized in s. Texas. Also planted in s. Calif. Leaves *narrow*, 1–2 in. long,  $\frac{1}{8}$ – $\frac{1}{2}$  in. wide, not leathery, wedge-based, and tips mostly blunt. Twigs *thin*, mostly 2½–5 in. long, *spine-tipped*, and sometimes alternating in more or less right-angle planes. Flowers whitish, in small clusters at the leaf angles. Fruits berrylike, *lavender*, about  $\frac{1}{4}$  in. in diameter. Height to 15 ft. **SIMILAR SPECIES:** Twigs of the other spine-tipped species in this group are shorter and more stout. **REMARKS:** Other peppertrees in our area have compound leaves (Pls. 23 and 24).

**OSAGE-ORANGE** *Maclura pomifera* (Raf.) C. K. Schneid. **PL. 28**

A medium-sized tree. Leaves 1–8 in. long, egg-shaped, U-based, somewhat *long-pointed*. Strong, bare, unbranched thorns  $\frac{1}{2}$ – $\frac{3}{4}$  in. long at each leaf scar. Sap *milky*. Wood *yellow*. Buds nearly ball-shaped; end one false. Bundle scars 1 to 5. Flowers tiny, greenish, in cylindrical leaf-angle clusters, May–June. Fruits green, *much wrinkled*, *grapefruit-sized*, Oct. Bark orange-brown, furrowed, tight, fibrous. Height 50–60 ft.; diameter 18–36 in. In thickets; has spread widely, especially in e. and nw. U.S. **SIMILAR**

**SPECIES:** Osage-orange and the bumelias are our only thorny plants with milky sap. This species differs from the bumelias in leaf shape and in having bare thorns and shorter and more rounded spur branches.

**REMARKS:** Once native in n. Texas, se. Okla., and nearby Ark., home of Osage Indians, this species was widely planted for living fences before the invention of barbed wire. Because of its use in making





bows, the French name *bois d'arc* (colloquially "bodarc," "bodock") is still heard. Bark yields tannin; boiled wood chips yield yellow dye. William Maclure was an American geologist who lived from 1763 to 1840.

## THORNLESS TREES WITH ALTERNATE FAN-LOBED LEAVES (PLATE 29)

There are not many thornless alternate-leaved trees with fan-lobed leaves. The mulberries (with milky sap) and fremontias (sap clear) have leaves that may be either fan-lobed or not. They are, in any case, fan-veined. White Poplar (Pl. 31) has white-woolly leaves that are often somewhat or even deeply fan-lobed. Cliffrose (Pl. 44) has tiny fan-lobed evergreen leaves, but the lobing is not obvious as such; they are here regarded as merely being toothed. The fan-lobed leaves of maples (see Pl. 15) are opposite, not alternate.

### CALIFORNIA FREMONTIA

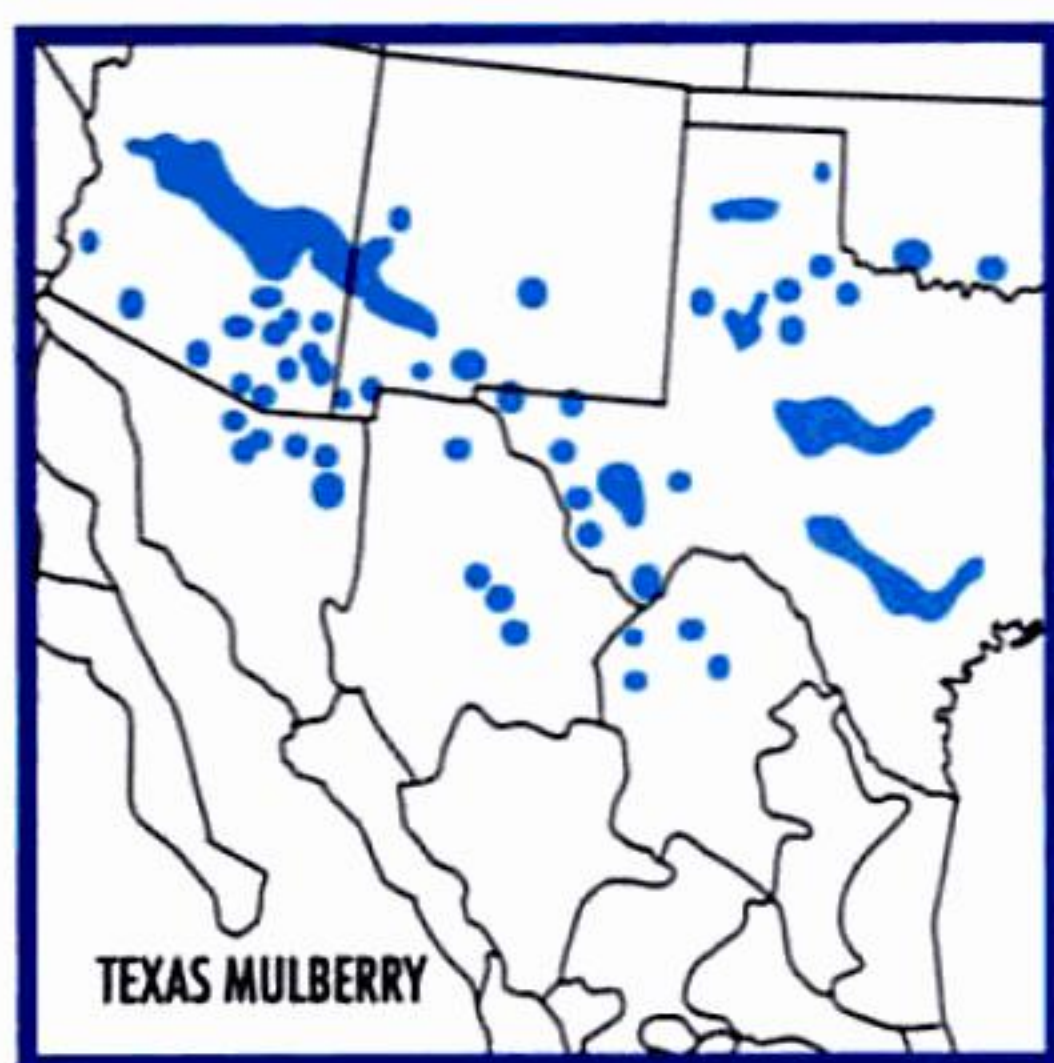
PL. 29

*Fremontodendron californicum* (Torr.) Cov.

An *evergreen* tree or shrub principally of mountain slopes throughout Calif. but also in cen. Ariz. and Baja California Norte. Leaves only 1–2 in. long, *leathery*, and with 1–3 main veins meeting at the leaf base. Usually with 3 (sometimes 5–7) lobes, occasionally with none. Lobes may be wavy-toothed. Leaf undersides *densely hairy*. Twigs stout, rusty-hairy; buds *without* scales; bundle scar 1. Flowers 1–2½ in. across, petals absent, sepals *bright yellow* and petallike, showy, mostly on *spur branches*, May–June. Fruits 1–1¼ in. long, pointed, dry, hairy, egg-shaped capsules, Aug.–Sept. Height to 25 ft.; diameter to 12 in. **SIMILAR SPECIES:** See Mexican Fremontia. **REMARKS:** Member of the chocolate family. Some-







*brown*. **SIMILAR SPECIES:** Other mulberries have sandpapery foliage. In winter, Red Mulberry may be separated by its greenish brown, dark-edged buds and red-brown bark. **REMARKS:** Introduced by the British in colonial times in an unsuccessful attempt to establish a silkworm industry.

#### RED MULBERRY *Morus rubra* L.

PL. 29

Similar to White Mulberry but leaves somewhat *sandpapery* above and hairy beneath, bases usually even. Buds *greenish brown*, with 5–6 bud scales mostly *with* darker scale borders. Trunk bark *red-brown*. Fruits red-black, tasty. Lowlands, e. U.S. west to w. Okla. and cen. Texas. **SIMILAR SPECIES:** See (1) White Mulberry and (2) Paper-mulberry. **REMARKS:** Fruits eaten by squirrels and numerous song and game birds as well as by humans.

#### PAPER-MULBERRY *Broussonetia papyrifera* (L.) Vent.

PL. 29

A medium-sized tree with *sandpapery* leaves and twigs. Leaves 4–11 in. long, fine-toothed, varying from unlobed and heart-shaped to deeply and intricately *lobed*. Leaves sandpapery above and velvety below, often with uneven bases. Twigs *rough-hairy*; buds with only 2–3 visible scales; bundle scars 4 or more. Pith blocked by a thin *woody partition* near each bud. Bark a *yellow-brown* smooth network of fine ridges. Height to 50 ft.; diameter to 4 ft. Flowers April–May. Fruits red, fleshy, barely edible, Sept. Widespread but local; found in hedgerows. **SIMILAR SPECIES:** (1) White Mulberry has smooth leaves while (2) Red Mulberry has less rough upper leaf surfaces. Both of these species have continuous pith and 5–6 bud scales. **REMARKS:** Introduced from Asia. There the inner bark once was used as paper. In the S. Pacific, the inner bark is hammered into cloth. P. M. A. Broussonet was a French naturalist of the late 18th century.





## SYCAMORES (*Platanus* SPECIES)

Large floodplain and lowland trees with distinctive light green, whitish, or mottled bark that flakes off in irregular puzzlelike pieces, exposing *yellowish and whitish underbark*. Leaves 4–10 in. long, nearly hairless, 3- or 5-lobed, sometimes toothed. Leafstalk bases *hollow*, covering buds; leaf scars *surround* buds. Pith continuous. Buds hairless and covered by a *single* scale; end bud false. Bundle scars many. A single, saucerlike, leafy, toothed stipule clasps and encircles twig at points of leaf attachment; stipule scars *ring* winter twigs. Flowers small, in *globose* heads, April–June. Fruits small and hairy, in tight, brown, long-stalked, hanging balls,  $\frac{3}{4}$ –1  $\frac{1}{2}$  in. in diameter, Oct. and often through winter. Old World sycamores, often planted in cities, are called Plane-trees. They usually have 2 (London Plane, *Platanus acerifolia* Willd.) or more (Oriental Plane, *P. orientalis* L.) fruit balls per stalk and have more yellowish underbark. Hard coarse-grained wood used for boxes, barrels, butcher blocks, cabinetwork, and furniture. Native Americans in the East used trunks for dugout canoes. One such canoe reported to have been 65 ft. long and to have weighed 9000 pounds. Twigs eaten by deer and muskrats.



*Bark of California Sycamore*





Trunk and branch cavities sought for nests and shelter by wood ducks and raccoons.

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**CALIFORNIA SYCAMORE** *Platanus racemosa* Nutt. **PL. 29**

Occurs throughout Calif. and into Baja California Norte. Leaf lobes 3–5, rather narrow, sharply pointed, *mostly toothed*, and somewhat hairy beneath. Leaf sinuses extend about *halfway* to the leaf bases. Fruit balls 3–7 per stalk. Stream banks and canyons to 4000 ft. elevation.

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**ARIZONA SYCAMORE** *Platanus wrightii* S. Wats. **PL. 29**

Sometimes considered to be only a variety of California Sycamore but with 5–7 deep leaf lobes and *not toothed*. Leaf sinuses extend *more than halfway* to the leaf bases. Fruit balls mostly 3–5 per stalk. Trunk and large branches often almost completely white. Floodplains and valleys, at elevations of 2000–6000 ft.; in Ariz., sw. N.M., and nw. Mexico.

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**EASTERN SYCAMORE** *Platanus occidentalis* L. **NOT SHOWN**

Like sycamores of the Southwest but leaves *toothed*, hairless, and with 3–5 *shallow* sinuses. Fruit ball *single*. Damp soils, w. to cen. Texas. **REMARKS:** Eastern Sycamore is generally conceded to be the most massive tree of the e. U.S., but unlike the long-lived sequoias, redwoods, and bristlecone pines of Calif., it is old at 500–600 years.

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**CHINESE PARASOLTREE** **PL. 29**

*Firmiana simplex* (L.) W. F. Wight

An Asian tree of the chocolate family, planted for ornament and locally growing wild. Long-stalked leaves 6–12 in. long, *sycamore-like*, with 3–5 lobes, *shallow* sinuses, and *no teeth*. Foliage occa-





May, occasionally white. Fruit pods 2–3 in. long, mostly  $\frac{5}{8}$ – $\frac{3}{4}$  in. wide, brown when mature, July–Aug. or longer. Height to 20 ft.; diameter to 6 in. Foothills, canyons, and slopes to 6000 ft. elevation from n. Calif. and s. Utah to s. Calif. and s. Ariz. **SIMILAR SPECIES:** Leaves distinctive. In winter, the combination of 3 bundle scars, buds with many scales, and lines on twigs distinguish it from unrelated species of this group. Eastern Redbud has long-pointed leaves, longer leafstalks, and thinner fruit pods. **REMARKS:** Blossoms, not buds, reddish. Flowers sometimes eaten in salads; red roots yield a dye. An exceptional legume species that does *not* harbor nitrogen-fixing root bacteria.

#### EASTERN REDBUD *Cercis canadensis* L.

**NOT SHOWN**

A tree of the e. U.S. with range extensions into w. Texas and, locally, N.M. It is planted for ornament elsewhere in the West. The typical form is much like California Redbud but leaves are *long-pointed*, heart-shaped, and *not* leathery. Leafstalks are mostly over  $1\frac{1}{4}$  in. long. A variety of the eastern species known as Texas Redbud (*C. canadensis* var. *texensis* [Wats.] Hopkins) also has leathery leaves, however, that appear remarkably like those of California Redbud. In Texas and Okla. this variety may grow along with typical Eastern Redbud. Fruit pods are *less than*  $\frac{1}{2}$  in. wide in both Eastern Redbud and its Texas variety but *over*  $\frac{5}{8}$  in. wide in California Redbud.

#### CAROLINA BASSWOOD *Tilia caroliniana* Mill.

**PL. 30**

The basswoods are a group of eastern trees. Of these, Carolina Basswood extends west to cen. Texas. Leaves 3–6 in. long, 2–3 in. wide, *fine-toothed*, smooth, thin, deciduous, more or less *heart-shaped*, often uneven-based, and either somewhat hairy or hairless beneath. Twigs hairless; when cut with a knife, the inner bark can be pulled away in a *fibrous* strip. Buds green to red with 2–3 visible scales; end bud false. More than 3 bundle scars per leaf scar. Pith continuous. Flowers small, yellowish, fragrant, June–Aug. Fruits are small, tan, spherical nutlets clustered beneath slim, leafy wings that act as spinning parachutes when fruits are ripe, Aug.–Oct. Fertile soils. **SIMILAR SPECIES:** The few-scaled buds







and ridges. See also remarks on Spiny Hackberry under Jujube (p. 268).

Although the thornless hackberry species do not always display clear-cut identifying marks, ideally distinctions are as marked on the comparison chart opposite Pl. 30.

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**NETLEAF HACKBERRY** *Celtis reticulata* Torr. **PL. 30**

Like the next species with leaves *wide* (about half the leaf length), somewhat *leathery*, strongly net-veined beneath, and with *few* teeth or none. Leafstalks about  $\frac{1}{8}$ – $\frac{1}{4}$  in. long. In this species the leaves are 2–3 in. long and *green* beneath. Twigs hairy. Fruits remain *smooth* upon drying and fruitstalks mostly *longer* than leafstalks. Height to 50 ft.; diameter to 2 ft. A southwestern species that ranges deep into n. Mexico but apparently is not known from s. Texas. It occurs locally elsewhere in the West. Watercourses and hillsides. Fruits were formerly eaten by Native Americans.

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**SOUTHERN HACKBERRY** *Celtis laevigata* Willd. **PL. 30**

This species of the southeastern states ranges west through much of Texas. It differs from Netleaf Hackberry in that the leaves are mostly 2–4 in. long and the fruitstalks average *shorter* than the  $\frac{1}{4}$ – $\frac{1}{2}$ -in. leafstalks. Fruits are generally *smooth* upon drying. Height to 100 ft. in favorable locations. Streamsides and moist soils. Eaten occasionally by wild turkeys.

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**LINDHEIMER HACKBERRY** **PL. 30**  
*Celtis lindheimeri* Engelm. ex K. Koch

Found only in s. Texas and Coahuila, Mexico, this small tree is similar to Netleaf Hackberry but the leaves are *narrow*, about  $\frac{1}{3}$  as wide as long with *pale, soft-haired* undersides and leafstalks  $\frac{1}{4}$ – $\frac{1}{2}$







in. long. Fruits *wrinkled* when dry with stalks shorter than leaf-stalks. Height to 35 ft.; diameter to 6 in. Called Palo Blanco in Spanish.

## NORTHERN HACKBERRY *Celtis occidentalis* L. PL. 30

An eastern tree extending west to the Great Plains from N.D. to Okla; cultivated elsewhere. Leaves 3–5 in. long, usually thin and *not* leathery, with teeth *numerous*. Twigs hairless. Fruitstalks *longer* than the  $\frac{1}{4}$ – $\frac{1}{2}$ -in. leafstalks, and fruits *wrinkle* upon drying. Height 20–70 (100) ft.; diameter 1–3 (4) ft. Streamsides. Fruits eaten by many songbirds and game birds.

## *Ceanothus* SPECIES

This is a large and mainly shrubby genus, principally western in distribution. In Calif. alone, 43 species are listed, predominantly components of the brushy vegetation type commonly called chaparral. Three thornless species regularly reach tree size. Though some shrubby species have opposite and often deciduous leaves, the foliage of our trees is alternate and *evergreen*. Bundle scar 1. Flowers small, in many-flowered dense clusters. Fruits small, dark, more or less 3-lobed, several-seeded capsules. *Ceanothus* species are unusual in that, though not legumes, they nevertheless possess nitrogen-fixing root nodules. *Ceanothus* plants are often called Wild-lilac. Greenbark Ceanothus, a thorny tree, is on Pl. 28.

## BLUEBLOSSOM CEANOTHUS PL. 30

*Ceanothus thyrsiflorus* Eschsch.

Occurring on the outer slopes of the coastal ranges from sw. Ore. to Santa Barbara Co., Calif., this tree is a member of both forest



## POPLARS, INCLUDING ASPENS AND COTTONWOODS (PLATE 31)

The poplars, aspens, and cottonwoods are all members of the genus *Populus*. The leaves are mostly toothed and (except Narrowleaf Cottonwood) somewhat triangular, with 3–5 *main veins meeting near the leaf base*. Most poplars tend to have unusually long leafstalks. In some species these are *flattened* near the leaf blade so that the leaves flutter even in a slight breeze.

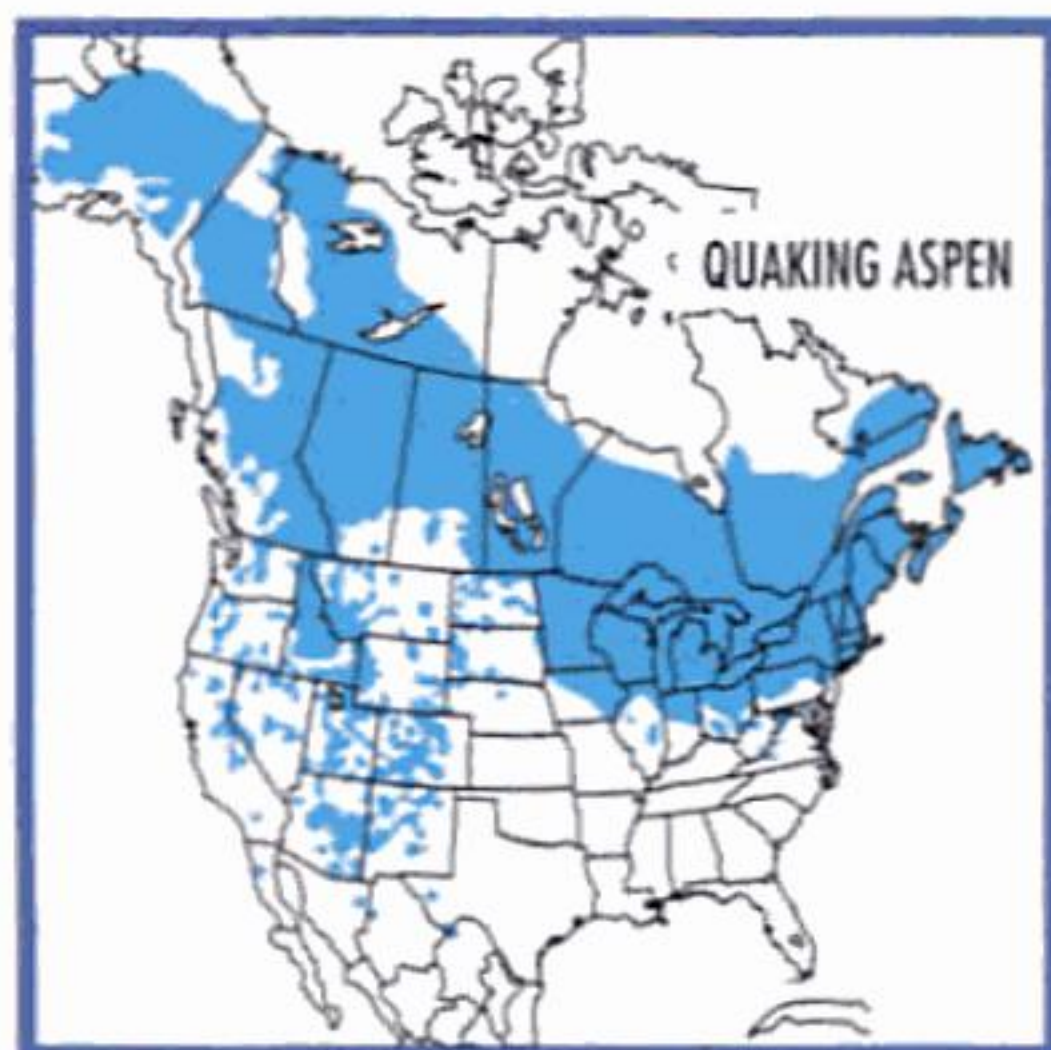
Poplar buds are often long-pointed, and it is characteristic that the lowermost bud scale is directly above the leaf scar. The end bud is true and may have more scales than side buds. The bark of most species is distinctively smooth and greenish white when young and dark-furrowed when older. The twigs are mostly hairless and often sharply angled (somewhat ridged). Bundle scars 3 or in three groups. Spur branches occasional. Flowers of poplars are in long, clustered, caterpillarlike catkins that appear in early spring and soon release hairy, cottonlike fruits. These are “caught” by and germinate on moist soils. The sexes are separate (but female Lombardy Poplars are unknown).

Distributed widely in the northern hemisphere, trees of the poplar group may form extensive forests on barren, burned, or cleared areas. Fast-growing, mostly short-lived species, they are of most value as paper pulp, though some of their soft lumber is used in construction work and in the manufacture of boxes and woodenware. Some kinds are of value as ornamentals and wind-breaks. In dry country, cottonwoods indicate the presence of underground water near the surface. Seeds, buds, and twigs are important foods of numerous birds and mammals, including ruffed, spruce, and sharptail grouse, prairie chicken, whitetail

### *Quaking Aspen*







deer, elk, moose, porcupine, snowshoe hare, cottontail rabbit, and black bear. Beavers consume the inner bark and use the branches in dam and lodge construction.

### QUAKING ASPEN *Populus tremuloides* Michx.

PL. 31

A medium-sized transcontinental species with the most widespread distribution of any N. American tree. Leaves 2–6 in. long, with *flattened* leafstalks. Blades nearly *circular*, without leaf-base glands and edged with 20–40 pairs of *fine teeth*. Twigs hairless and dark brown; end bud shiny,  $\frac{1}{4}$ – $\frac{3}{8}$  in. long. Young bark mostly *smooth, chalk white to yellow-green*; old trunks dark and fissured near the tree base. Height 20–50 (75) ft.; diameter 1–2 (3) ft. Varied open sites. **Similar species:** (1) Fremont Cottonwood has fewer and larger leaf teeth, a longer end bud, and dark furrowed bark. (2) Lombardy Poplar has dark bark, yellow twigs, leaves that are more heart-shaped or triangular, and a tall, slender silhouette. (3) Paper Birch (Pl. 41), with white trunk and often growing in the same habitat, has peeling and finely cross-striped bark. **Remarks:** Becomes golden yellow in autumn. Reproduction by root sprouts is frequent. Vegetative clones often spread over considerable areas; some groves have been calculated to live 10,000 years. Widely known as Popple and Trembling Aspen.

### TALLOWTREE *Sapium sebiferum* (L.) Roxb.

NOT SHOWN

A Chinese tree reported to be spreading in the lower Rio Grande Valley of Texas. Leaves *aspenlike*, 2–6 in. long, pointed at both ends, and not toothed (sometimes wavy-edged). Leafstalks *not* flattened, with paired glands at the leaf base. Twigs green, bundle scars 3 or indistinct. Sap milky, *poisonous* if rubbed in the eyes or taken internally. Flowers small, greenish, at twig ends, spring; fruits  $\frac{1}{4}$ -in. waxy capsules splitting to show 3 white seeds on a





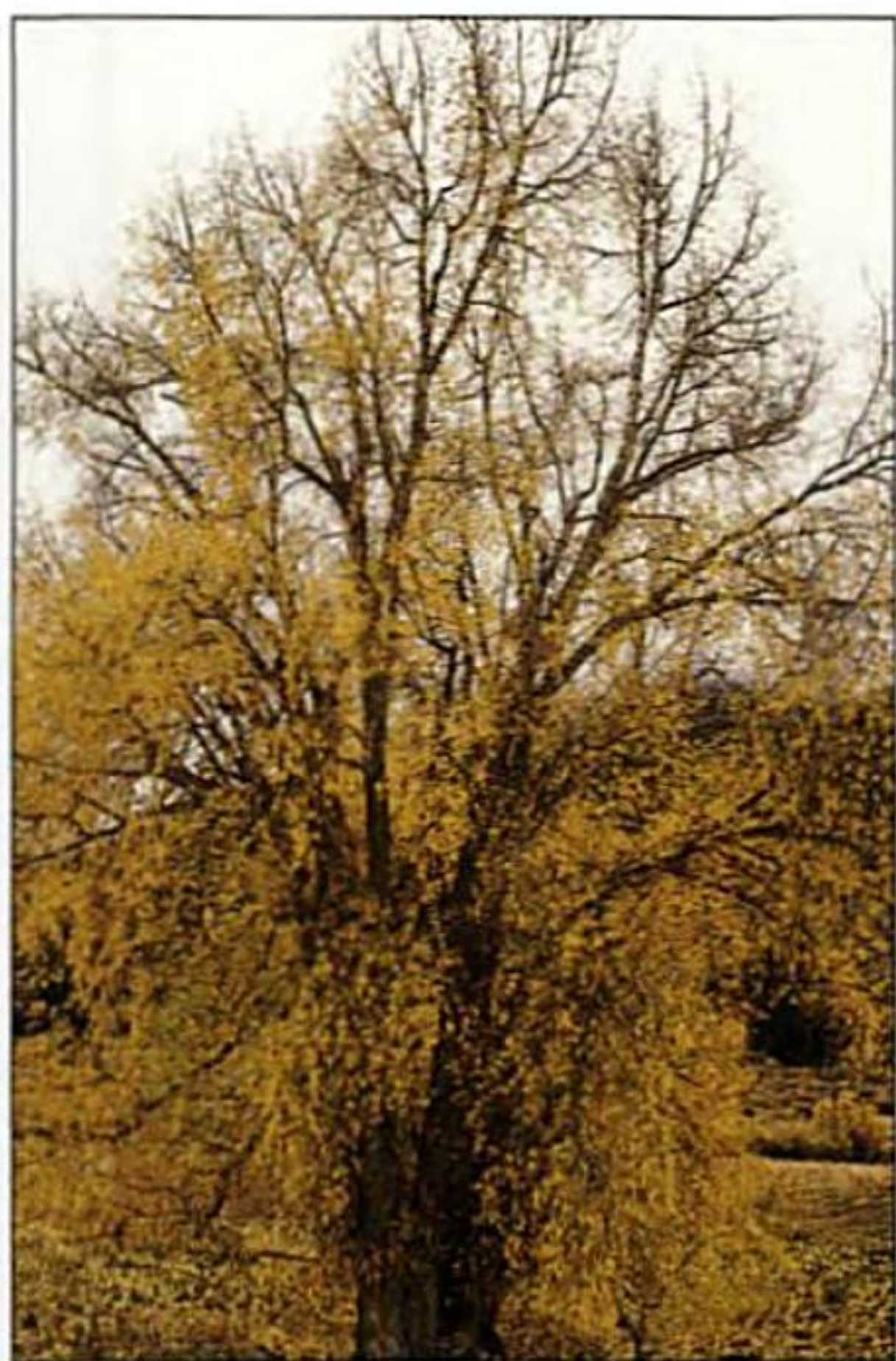
6500 ft. elevation. **SIMILAR SPECIES:** (1) Quaking Aspen has fine-toothed circular leaves and brown twigs. (2) Black Cottonwood has rounded leafstalks and gummy buds. (3) Eastern Cottonwood has coarse-toothed foliage, leaf glands, and gummy buds. (4) Lombardy Poplar has a slender, steeplelike outline. **REMARKS:** Common and scientific names both honor Col. John C. Fremont, the famous western explorer. The Spanish name for cottonwood is *alamo*.

## NARROWLEAF COTTONWOOD

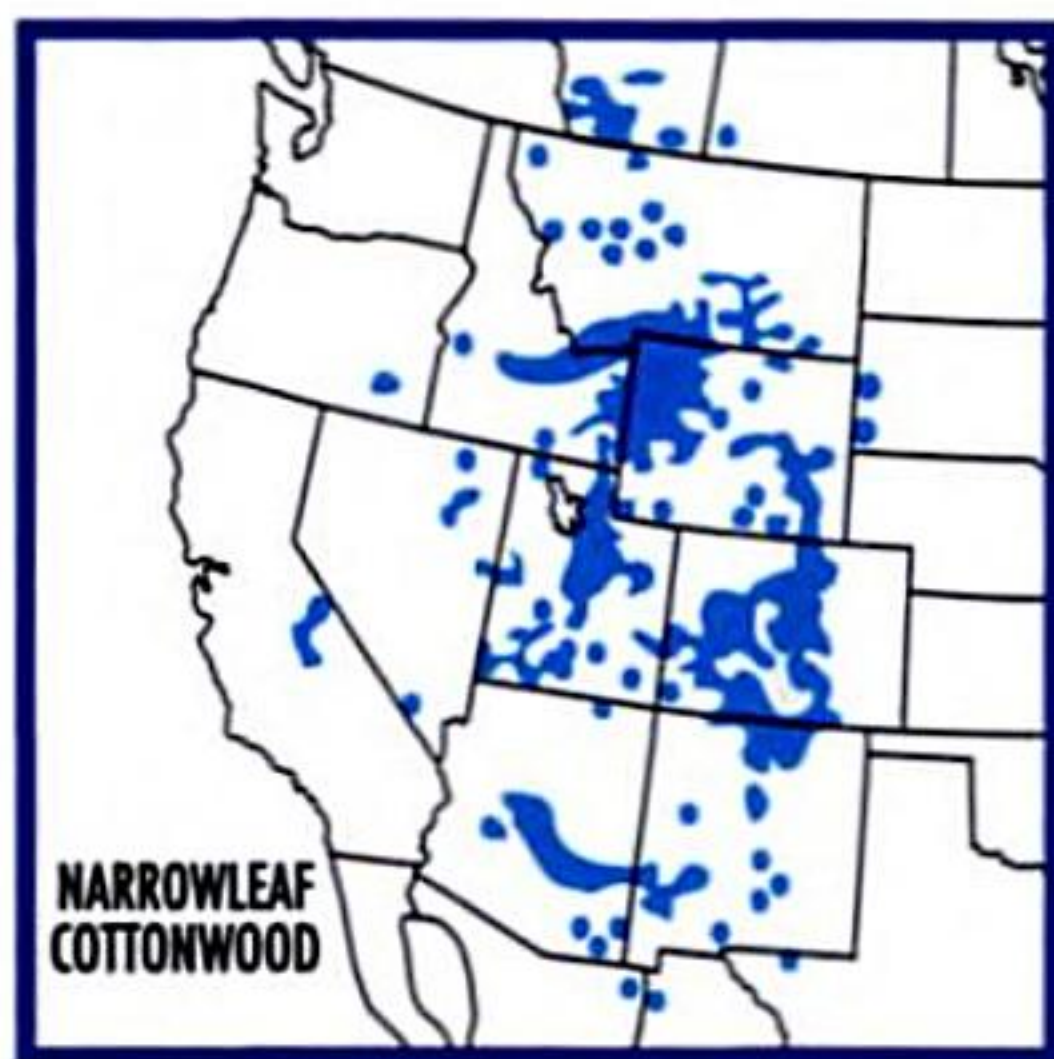
PL. 31

*Populus angustifolia* James

Willowlike in appearance and habitat but with whitish upper bark and shiny *several-scaled* buds. Mainly found in the Rocky Mts., the *slender foliage* is unique among our poplars. Leaves 3–5 in. long and only about a *third* as wide, fine-toothed, feather-veined, and without glands. Leafstalks  $\pm$  rounded but *flattened* on top and only  $\frac{3}{8}$ –1 in. long. Twigs yellowish, hairless; end bud  $\frac{1}{4}$ – $\frac{1}{2}$  in. long and quite *sticky*. Trunk bark rather smooth and whitish, becoming darker and furrowed. Height to 60 ft.; diameter to 1½ ft. Along watercourses and on other sometimes-wet sites. **SIMILAR SPECIES:** No other poplar has such narrow leaves and short leafstalks. (1) Black Cottonwood and (2) Balsam Poplar have rounded leafstalks



*Narrowleaf Cottonwood*





and buds spicy-scented when crushed, while (3) Eastern Cottonwood has glandular leafstalks and a larger end bud. (4) Quaking Aspen and (5) Fremont Cottonwood do not have sticky buds. (5) Willows (Pls. 36–38) have nonsticky single-scale buds. **REMARKS:** The most abundant tree along many central Colorado streams. Also called Lanceleaf Cottonwood. Hybridizes with Eastern Cottonwood where the ranges meet.

#### LOMBARDY POPLAR *Populus nigra* var. *italica* Muenchh. PL. 31

An imported, tall, thin, *steeplelike* tree much used to border gardens and for windbreaks. Leaves 2–8 in. long, *fine-toothed*, without glands. Leafstalks *flattened*. Twigs hairless, yellowish; end bud less than  $\frac{3}{8}$  in. long and *not* gummy. Bark furrowed, rather dark. Height 30–70 (100) ft.; diameter 1–2 (3) ft. Sometimes escapes from plantings. **SIMILAR SPECIES:** The narrow, columnar growth form is distinctive. **REMARKS:** Believed to have arisen as a genetic mutation in Italy during the 1700s. All trees are male. Reproduction is from cuttings and sprouts.

#### BLACK COTTONWOOD

PL. 31

*Populus trichocarpa* Torr. & Gray

Ranging primarily south along the Pacific slope from s. Alaska to Baja California Norte, this species also is distributed inland to the n. Rockies. Leaves 4–8 in. long, including 1–2½-in. stalks that are *not* flattened. Leaf blades dark green above and pale to *silver-white beneath* (the contrast being especially visible during wind gusts); leaves more or less *triangular*, *fine-toothed*, *hairless*, and often with basal glands. Young leaves more slender. Twigs brownish, hairless; end bud  $\frac{3}{4}$ – $\frac{7}{8}$  in. long, *gummy* and *spicy-scented* when crushed. Fruit capsules *3-parted*. Height 60–80 (165) ft.; diameter 2–3 (9) ft. Floodplains and other moist soils. **SIMILAR SPECIES:** (1) Quaking Aspen, (2) Eastern Cottonwood, and (3) Fremont Cottonwood may have overlapping ranges with Black Cottonwood in some areas. All have flattened leafstalks, however, and end bud under  $\frac{1}{2}$  in. long. (4) White Poplar has white-woolly foliage and twigs. (5) Balsam Poplar,





hares browse the twigs, while porcupines eat the growing layer beneath the bark. The list of species eating acorns includes many songbirds, ruffed and sharptail grouse, prairie chicken, bobwhite quail, wild turkey, ringneck pheasant, mourning dove, wood duck, whitetail deer, black bear, red and gray foxes, raccoon, opossum, and squirrels.

The Spanish name *roble* (ROHB-leh) is often applied to deciduous oaks and *encino* (en-SEEN-oh) to evergreen oaks.

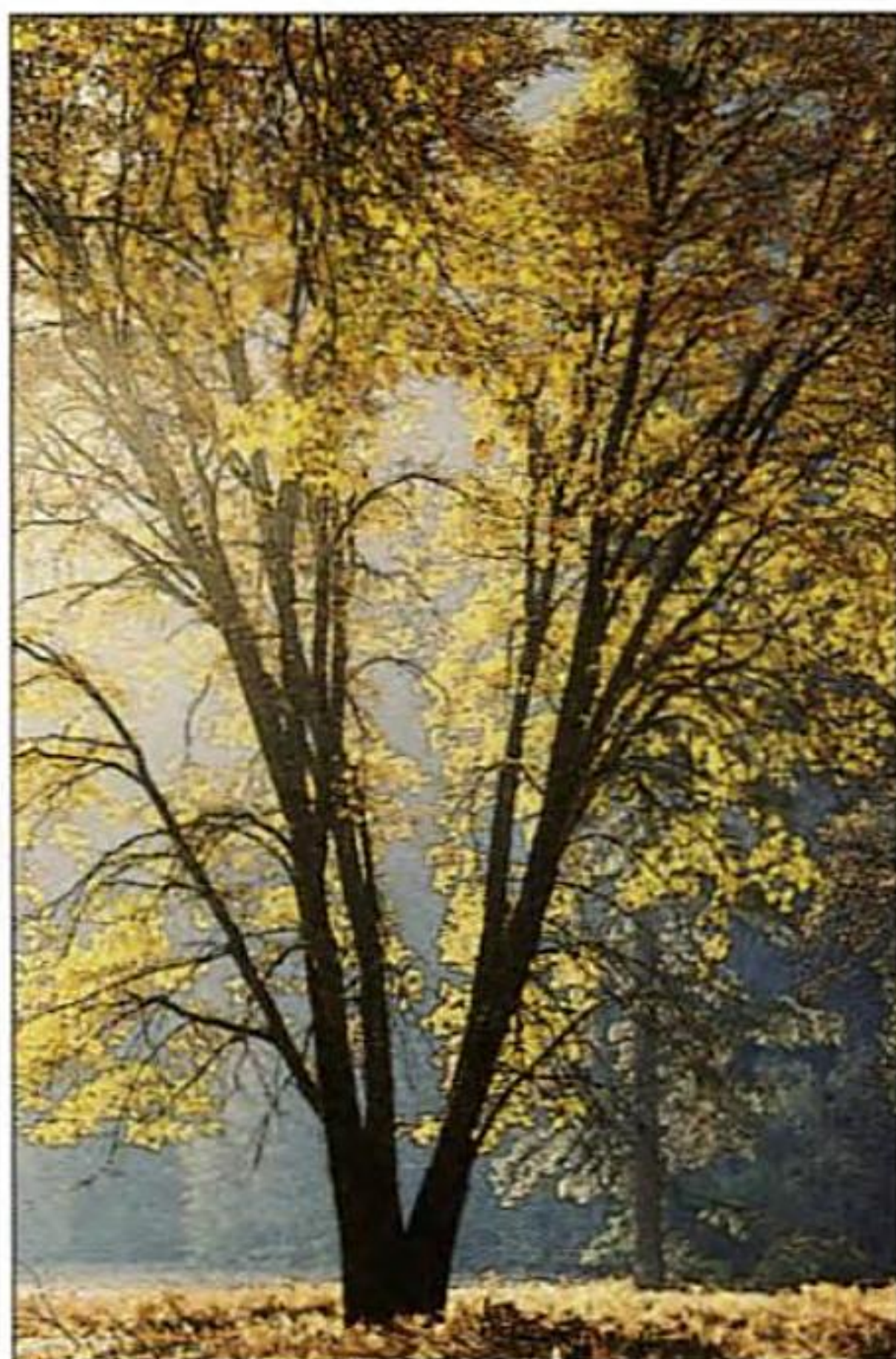
## OAKS I: WESTERN OAKS WITH DECIDUOUS AND MOSTLY LOBED LEAVES (PLATE 32)

There are only nine strictly western oaks with *deciduous lobed* foliage. All have leaves 2–7 in. long, and all except California Black Oak and Graves Oak are members of the white oak category. In addition, the ranges of several oaks of the e. U.S. (Pl. 35) extend westward on the Great Plains.

### CALIFORNIA BLACK OAK *Quercus kelloggii* Newb. PL. 32

Distributed mainly in Calif. but extending also into sw. Ore., this oak has leaves 4–7 in. long, dark green, with 5–7 *bristle-tipped lobes* often slightly hairy beneath. Leafstalks 1–2 in. long. Twigs

*California Black Oak*

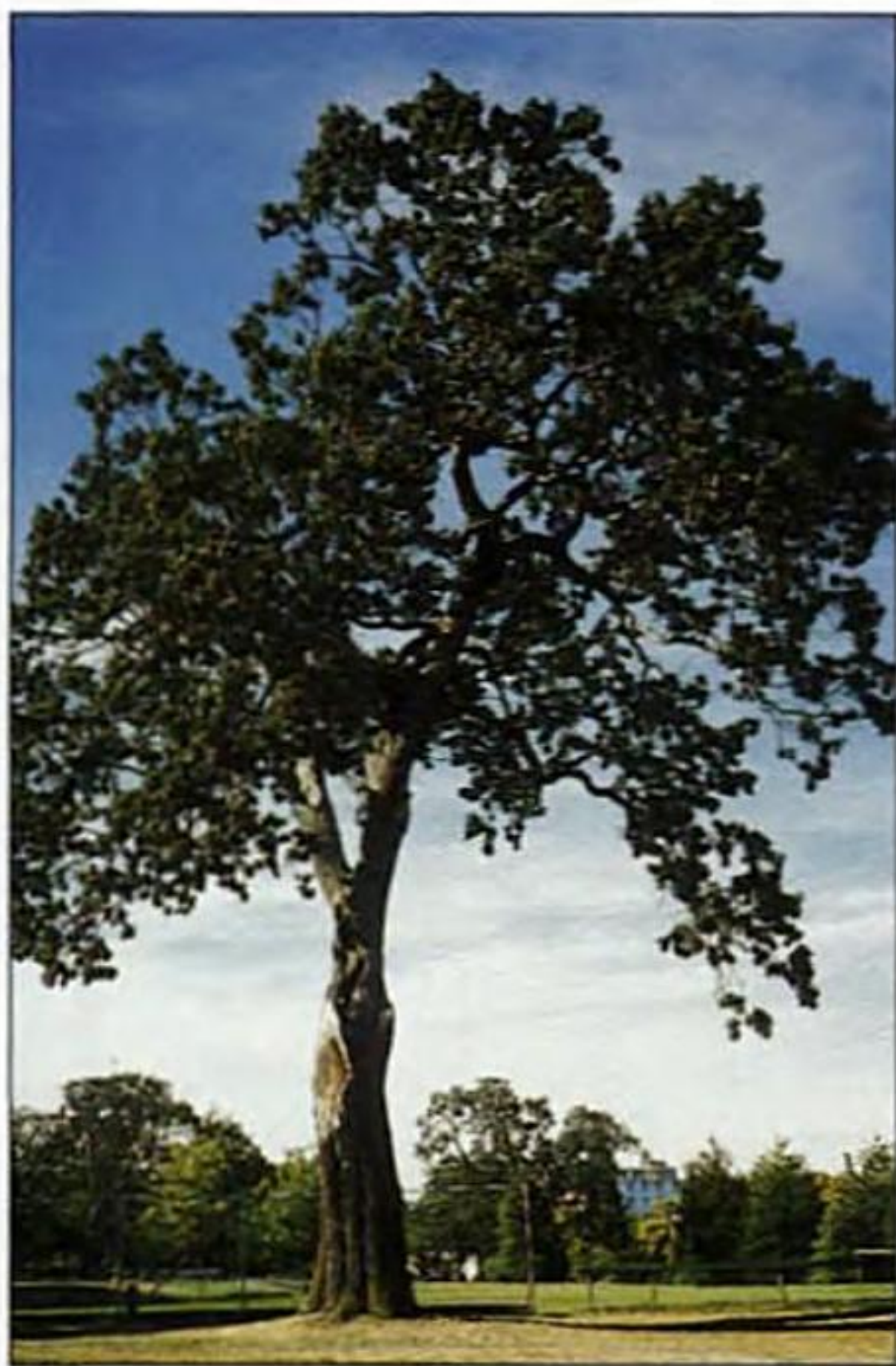




sometimes hairy; winter buds about  $\frac{1}{4}$  in. long, *hairless*, and with tips pointed. Acorns  $1-1\frac{1}{4}$  in. long; cups *bowl-shaped*. Height 30–75 (95) ft.; diameter 1–3 (4) ft. Mainly mountain slopes to 9000 ft. **SIMILAR SPECIES:** No other wild oak of the Pacific Slope has deeply lobed foliage with bristle tips. Several lobed-leaved and bristle-tipped red oaks of the e. U.S. (including some on Pl. 35) may be planted, however, in western landscaped areas. Most of these have acorns under 1 in. long (see Pl. 35).

**OREGON OAK** *Quercus garryana* Dougl. ex Hook **PL. 32**

Distributed from extreme sw. B.C. to cen. Calif., this species has large, thick, *leathery*, dark green, *shiny* leaves 3–5 in. long, 2–4 in. wide, usually hairy beneath, with 5–9 deep lobes and leafstalks  $\frac{1}{4}-\frac{1}{2}$  in. long. Twigs often hairy; buds  $\frac{1}{4}-\frac{1}{2}$  in. long, sharp, and *hairy*. Acorns  $\frac{3}{4}-1\frac{1}{4}$  in. long; cups saucerlike. Height 40–65 (90) ft.; diameter 1–2 (3) ft. Mountain slopes, coastal ranges, n. and cen. Sierra Nevada. **SIMILAR SPECIES:** (1) California Black Oak has bristle-tipped leaf lobes. See (2) Valley Oak. **REMARKS:** Nicholas Garry, an officer of the Hudson's Bay Co. in the early 1800s, helped David Douglas, the Scottish botanical explorer, in his expeditions. Also known as Oregon White Oak.



*Oregon Oak*





The largest western oak, this *small-leaved* species mainly occurs in Calif.'s central valleys and adjacent foothills. Leaves 2–4 in. long, 1½–3 in. wide, with 7–11 deep lobes. Foliage *thin, dull*, medium green, hairless, and with stalks ¼–½ in. long. Twigs *hairless* and tending to *droop*; buds about ¼ in. long, pointed, and often hairy. Acorns 1¼–2 in. long; cups *bowl-shaped*. Height 40–100 (125) ft.; diameter 3–5 (13) ft. Fertile soils to 6000 ft. elevation. Also on Santa Catalina and Santa Cruz islands, s. Calif.

**SIMILAR SPECIES:** (1) Oregon Oak has leaves larger, dark green, shiny, longer-stalked, and leathery, twigs often hairy and nondrooping, acorns smaller, and acorn cups more shallow. (2) Blue Oak has leaves smaller, blue-green, wavy-edged or toothed, and short-stalked. Also, its twigs are hairy. (3) Gambel Oak is a smaller tree of the s. Rockies. **REMARKS:** Sometimes called Weeping Oak, from the pendulous twigs. Early travelers reported that the acorns of this species was the principal food of Native Americans of the region. They were collected and stored in large quantities. On California's offshore islands, McDonald Oak, previously classed as a full species, is now regarded as a hybrid involving Valley Oak and a local shrub oak.

Valley Oak



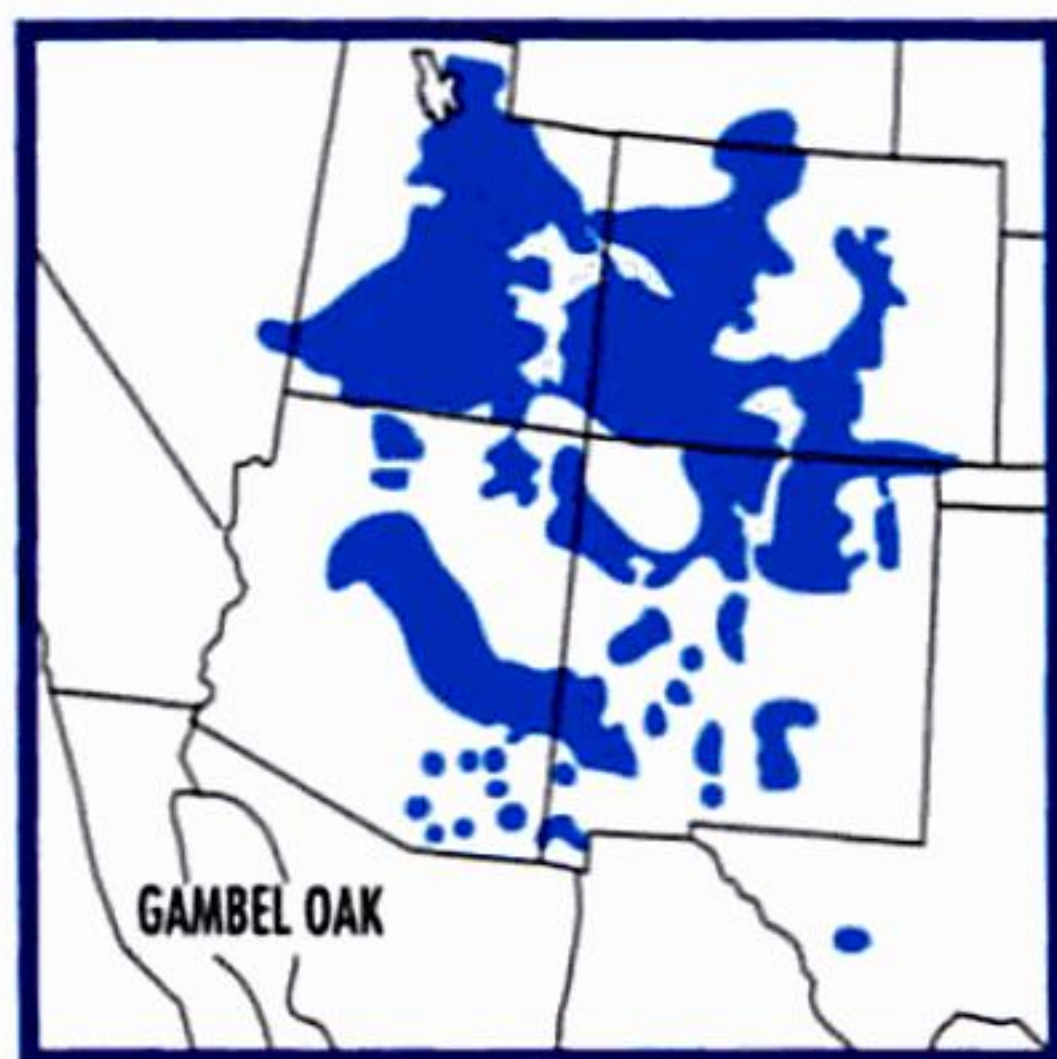


**BLUE OAK** *Quercus douglasii* Hook. & Arn.**PL. 32**

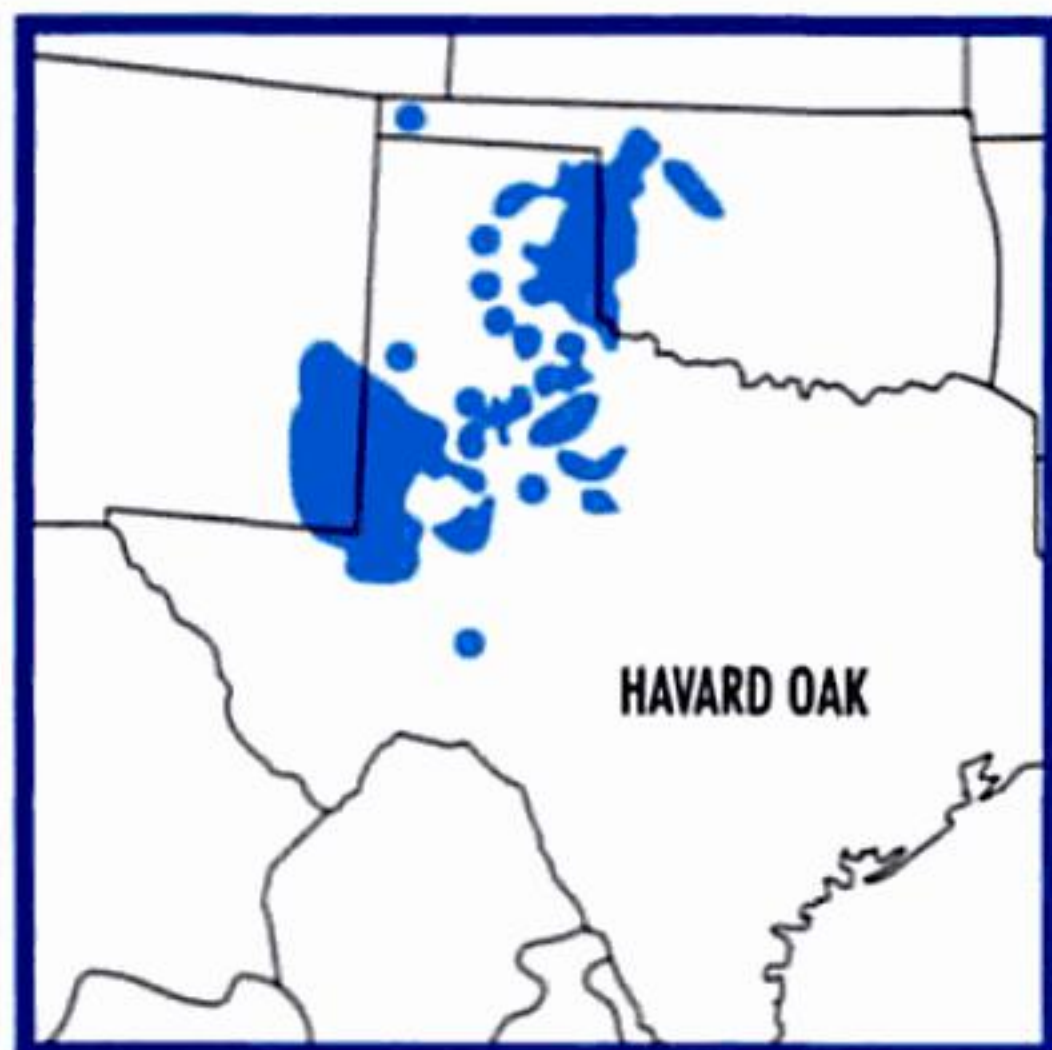
An oak of the interior valleys of n., cen., and s. Calif. with *blue-green* foliage *shallowly* lobed or sometimes few-toothed (rarely without either lobes or teeth). Leaves *small*, mostly 1–3 in. long, firm but not thick or leathery, sometimes hairy beneath. Leafstalks *only*  $\frac{1}{8}$ – $\frac{3}{8}$  in. long. Twigs *hairy*; buds about  $\frac{1}{4}$  in. long, *blunt*, and *not* hairy. Acorns  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. long; cups bowl-shaped. Height 25–50 (90) ft.; diameter 1–2 (3) ft. Dry slopes to 4500 ft. elevation, south to n. Los Angeles Co. **SIMILAR SPECIES:** The small blue-green leaves are readily recognized. Oaks of Pl. 33 have leathery, evergreen leaves. Except for the most northern populations of the prickly-leaved and evergreen Turbinella Oak, no species of Pl. 34 has a distribution that overlaps the range of Blue Oak. **REMARKS:** The scientific name commemorates David Douglas, the 19th-century Scottish botanist after whom the Douglas-firs (Pl. 8) also are named. In some areas, hybridization with Turbinella Oak is frequent. Intergrades involving Oregon Oak and Valley Oak also are not rare.

**GAMBEL OAK** *Quercus gambelii* Nutt.**PL. 32**

The only *deeply lobed* oak in the s. Rocky Mts. Leaves 2–6 in. long with 5–9 lobes, thick and *leathery*, yellow-green and mostly glossy above, somewhat hairy beneath. Leafstalks  $\frac{1}{4}$ – $\frac{3}{4}$  in. long. Twigs hairless; buds *under*  $\frac{1}{4}$  in. long, *sharp-pointed*, and hairless. Acorns  $\frac{3}{4}$ –1 in. long; cups bowl-shaped. Often shrubby but height to 65 ft.; diameter to 2 ft. Dry slopes to 10,500 ft. elevation. **SIMILAR SPECIES:** (1) Wavyleaf Oak, widespread in the Southwest, is interpreted as a group of hybrids involving Gambel Oak (Fig. 5). In w. Texas, (2) Graves Oak is a red oak species with bristle-tipped leaf lobes. East of the Rockies, also see Pl. 35. **REMARKS:** William Gambel collected birds and plants in the Rockies in 1844.







1–3 in. long, either with *medium-deep lobes* or *large teeth*. The foliage may be deciduous or evergreen, thin or somewhat leathery. Like the twigs, leaves are sometimes hairy. The buds are short, sharp, and hairless. Hybrids may be more frequent than the parent species. Both common and scientific names may offer useful references to accounts in other books. The plants grow on dry slopes within the range of Gambel Oak.

**HAVARD (SHIN) OAK** *Quercus havardii* Rydb. **PL. 32**

A frequently shrubby and highly variable species. Leaves 2–4 in. long, *shallowly lobed*, wavy-edged, or even without lobes, *leathery*, *bright green*, not shiny, and mostly *white-hairy* beneath. Leafstalks  $\frac{1}{8}$ – $\frac{3}{8}$  in. long. Twigs sometimes hairy, buds *small*, *blunt*, hairless. Acorns  $\frac{1}{2}$ –1 in. long; cups *bowl-shaped*. Height to 15 ft. Forms thickets, sandy soils. **SIMILAR SPECIES:** (1) Lacey Oak, occurring on Texas's Edwards Plateau, has hairless foliage, pointed hairy buds, and shallow acorn cups. See (2) Wavyleaf Oak. **REMARKS:** Born in France, Valery Havard was an American army physician. He collected plants while stationed in Texas in the late 1800s. Mohr Oak (Pl. 34) also is sometimes called Shin Oak.

**LACEY OAK** *Quercus laceyi* Small. **PL. 32**

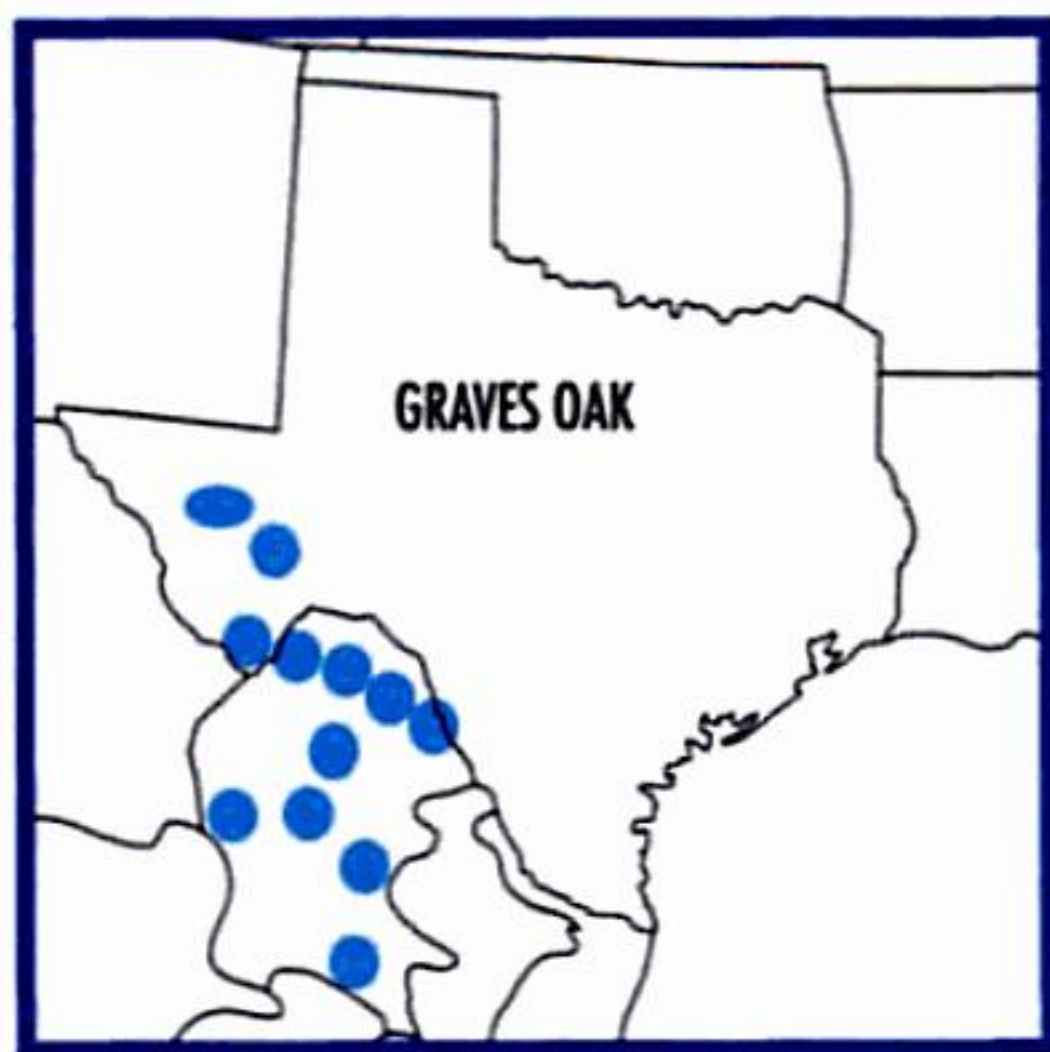
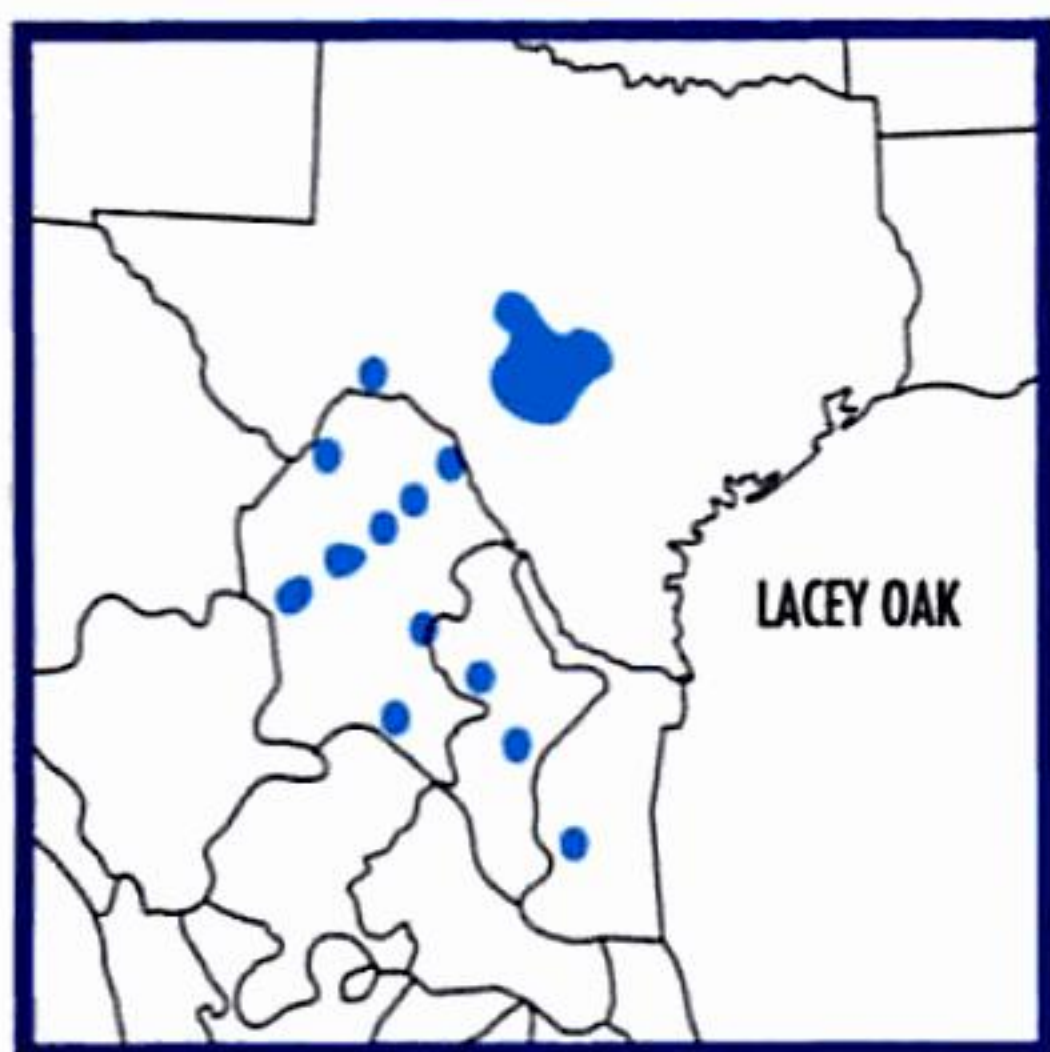
Similar to Havard Oak but distributed in the Edwards Plateau of cen. Texas and the mountains of ne. Mexico. Foliage *gray-green*, somewhat leathery, and mostly shallowly lobed. Leaves and twigs *hairless* with leafstalks  $\frac{1}{8}$ – $\frac{5}{8}$  in. long. Buds small, hairy, *pointed*. Acorns about  $\frac{3}{4}$  in. long, cups *saucerlike*. Often shrubby but sometimes a tree to 45 ft. tall. Rocky limestone soils and riverbanks. **SIMILAR SPECIES:** See several oaks of Pl. 35. **REMARKS:** Howard Lacey found the first specimen on his Texas ranch.

**GRAVES OAK** *Quercus gravesii* Sudw. **PL. 32**

A member of the red oak category. Leaves 2–5 in. long, somewhat *glossy* above, *not* leathery, mostly hairless, with *pointed*, *bristle-tipped* lobes. Leafstalks  $\frac{3}{8}$ –1 in. long. Twigs hairless, buds blunt, hairy, and more than  $\frac{1}{4}$  in. long. Cups *bowl-shaped*. Height to 50 ft.; diameter to 4 ft. In canyons mostly above 4500 ft. elevation in the Chisos, Glass, and Davis mts. of Texas and in Coahuila, Mexi-







**CO. SIMILAR SPECIES:** (1) Gambel Oak has white oak characteristics. See also (2) Chisos Oak, Pl. 34. **REMARKS:** Henry S. Graves was an early chief of the U.S. Forest Service and dean of the Yale University School of Forestry.

## OAKS II: EVERGREEN OAKS OF CALIFORNIA AND ITS BORDERS (PLATE 33)

Called live oaks because of their *evergreen* character, the trees of this plate range mainly in Calif. and have thick and rather leathery leaves, with smooth, wavy, toothed, or prickly edges. Like all oaks, these species have leaves and buds clustered at the twig tips. Buds of this group are under  $\frac{1}{4}$  in. long. Acorn cups are brownish, except in Canyon Live Oak. Tanoak differs somewhat.

While California Scrub Oak and Engelmann Oak are white oaks and Coast and Interior live oaks qualify as red oaks, Canyon and Island live oaks are among the few species termed intermediate oaks. Like red oaks, the acorns of intermediate oaks require two years to mature and have hairy inner acorn shells (not cups). These fruits grow on wood that does not normally produce new growth during the second year and thus appear to mature on twigs like white oaks.

Also with evergreen prickly leaves, Turbinella and Dunn oaks (Pl. 34) have ranges that extend into s. Calif. Golden Chinkapin and Pacific Bayberry (Pl. 39) occur in Calif. with evergreen leaves crowded toward the twig ends.

### CALIFORNIA SCRUB OAK *Quercus dumosa* Nutt. PL. 33

Variable in most of its characteristics and usually shrubby, this thicket-forming oak may occasionally become a small tree. Leaves mostly *under 1 in.* long, *shiny* green above, with bases  $\pm$  heart-







Coast Live Oak

*shaped*. Foliage  $\pm$  *hairy*, with veins raised beneath, the leaf edges often *prickly*. Twigs are brown, hairy or not; buds hairless and usually pointed. A white oak species with acorns  $\frac{1}{2}$ –1 in. long; cups are bowl-

shaped, *without* stalks, basal scales *strongly* warty, and margins *thick*. Trunk bark *grayish*. Height to 15 ft. Chaparral, coastal ranges. Also distributed in Baja California Norte. **SIMILAR SPECIES:** (1) Coast Live Oak and (2) Interior Live Oak are dark-barked and grow to a greater height. The former has markedly convex foliage, while leaves of the latter are larger, and acorns grow on both twigs and branchlets. (3) Turbinella Oak (Pl. 34) has acorn stalks  $\frac{1}{4}$ – $\frac{3}{4}$  in. long and leaves dull gray-green with the prickly tips longer. **REMARKS:** Botanists studying this species advise that only coastal plants with heart-shaped leaf bases should be recognized under this name.

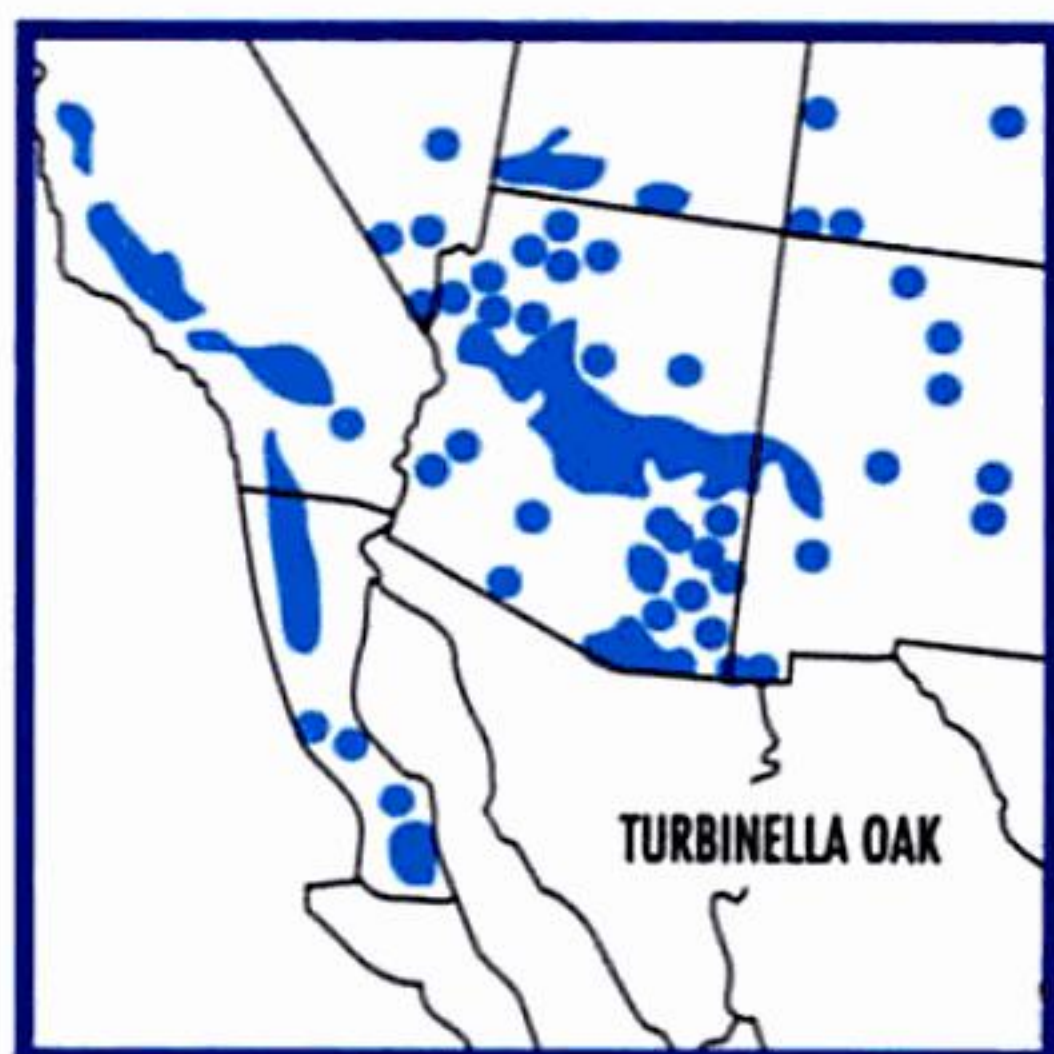
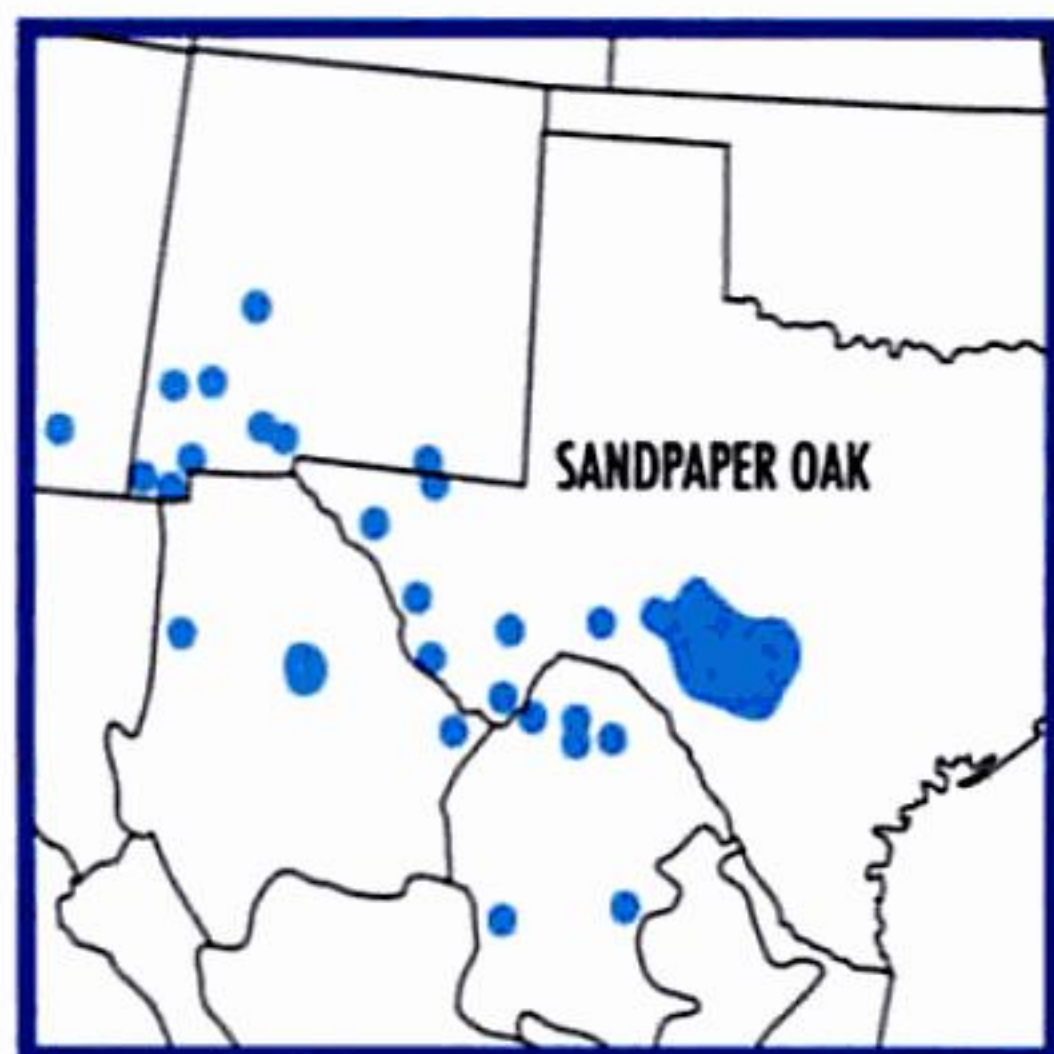
## COAST LIVE OAK *Quercus agrifolia* Nee

PL. 33

A broad-topped tree often forming open stands on California's coastal grasslands to 5000 ft. elevation. Leaves usually wide and







shrubby oak species also may be involved. Even experts disagree on the identity of many specimens, particularly Turbinella, Gray, and Arizona oaks but also others (see Wavyleaf Oak, Pl. 32).

**SANDPAPER OAK** *Quercus pungens* Liebm.

**PL. 34**

Usually a shrub but occasionally to 25 ft. tall. Leaves  $\frac{3}{4}$ –2 in. long, usually evergreen, 2–3 times longer than broad, light to dark green and shiny above, *rough-hairy* on both sides, and with V-shaped bases. Leaf edges markedly *crinkled*, sharply toothed, and *often prickly*, yet sometimes without teeth. Twigs hairy. Buds under  $\frac{1}{8}$  in. long, blunt, sometimes somewhat hairy. Acorns  $\frac{1}{2}$ –1 in. long, narrowly *cylindrical*, maturing on the twigs, nuts hairless within; cups bowl-shaped on  $\frac{1}{16}$ – $\frac{1}{8}$ -in. stalks. Rocky slopes. **SIMILAR SPECIES:** Sandpapery leaf texture distinctive among oaks. (1) Turbinella Oak has flat, mostly hairless, blue-green leaves with somewhat more prolonged, hollylike leaf teeth. It has saucerlike acorn cups on  $\frac{1}{4}$ –1  $\frac{3}{4}$ -in. stalks. (2) California Scrub Oak (Pl. 33) has a coastal distribution and smaller leaves. See (3) Vasey Oak. **REMARKS:** Though the leaves do not always conform, the specific name *pungens* means sharp, prickly. The name Scrub Oak is applied to this but also to several other oak species.

**VASEY OAK** *Quercus vaseyana* Buckl.

**NOT SHOWN**

Similar to Sandpaper Oak but often deciduous and with leaves 4–6 times longer than broad and edges  $\pm$  flat. Foliage mostly short-hairy beneath and bases U-shaped. Acorn cup saucer- to bowllike. To 35 ft. tall. W. and n. Texas, n. Mexico.

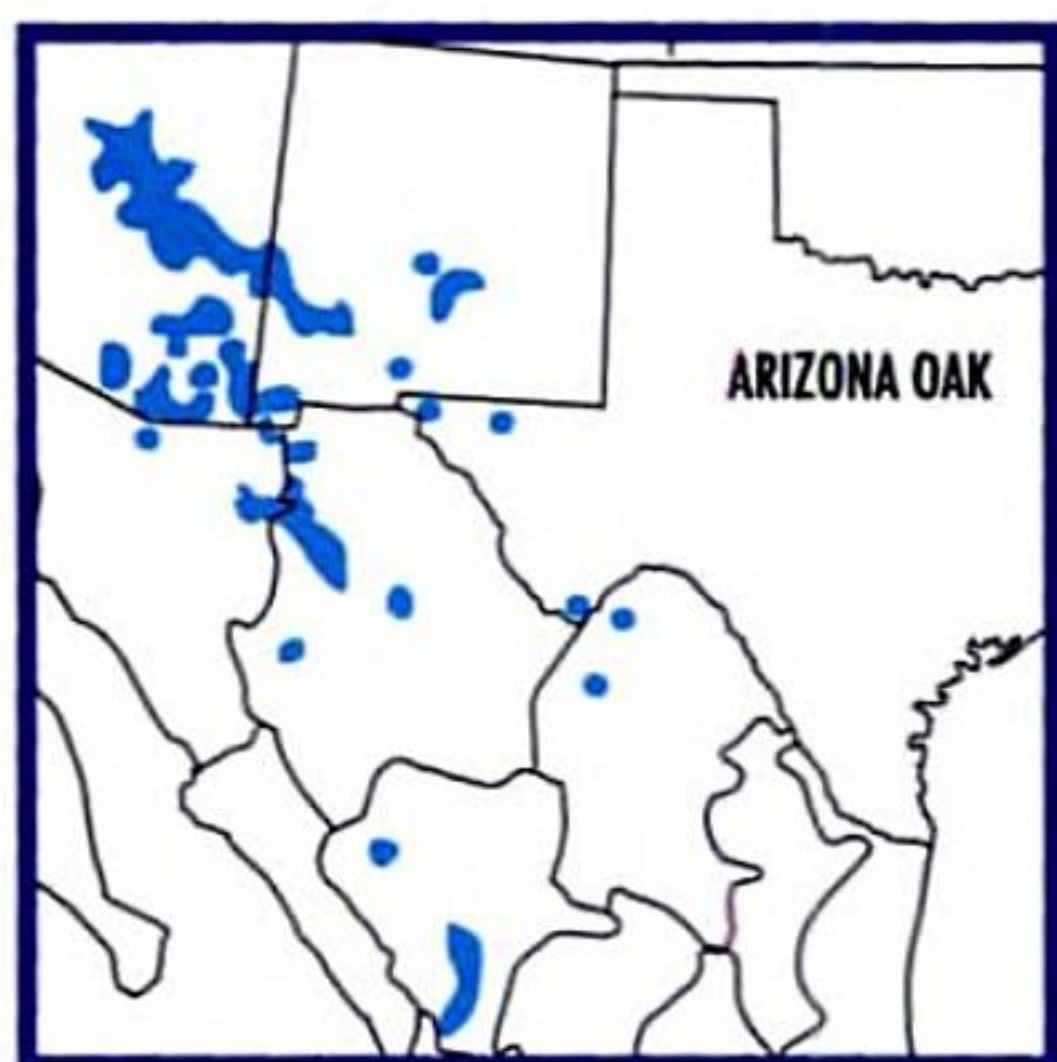
**TURBINELLA OAK** *Quercus turbinella* Greene

**PL. 34**

Frequently shrubby and often with *prickly* hollylike leaves. Its 1–2-in. leaves are dull, *gray-green*, usually hairless above, mostly







*Bark of Arizona Oak*



*the tip*, sometimes moderately convex, and either toothed or not. Twigs hairy; buds *globular*,  $\frac{1}{16}$ – $\frac{1}{8}$  in. across, and  $\pm$  yellow-hairy. Acorns  $\frac{1}{4}$ – $\frac{3}{4}$  in. long and with stalks to  $\frac{3}{4}$  in. or none; cup bowl-shaped. Trunk bark thick. Height to 65 ft.; diameter to 3 ft. Canyons and rocky slopes mostly below 7000 ft. **SIMILAR SPECIES:** (1) Netleaf Oak leaves, also with veins much raised beneath, are usually darker, shiny, and markedly convex. Its acorns have 1–3-in. stalks. The leaves of (2) Gray Oak are pointed, smaller, and with veins subdued. (3) Emory Oak foliage is shiny on both surfaces. (4) Silverleaf Oak has narrow, silver-hairy, pointed leaves. **REMARKS:** A member of the white oak series and often called Arizona White Oak. Intergrades with Gray and Turbinella oaks are widespread (see under Wavyleaf Oak and Fig. 5, p. 297).

#### MOHR OAK *Quercus mohriana* Buckl.

PL. 34

A thicket-forming white oak species with leaves 1–4 in. long, *dark green* and *shiny* above, *gray- or white-hairy beneath*, wavy-edged or with a few teeth, and with edges *scarcely* if at all rolled under. Twigs are sometimes hairy; buds dark,  $\frac{1}{16}$  in. long, blunt, sometimes slightly hairy. Acorns  $\frac{1}{4}$ – $\frac{1}{2}$  in. long; cup bowllike. Height to 20 ft. Low hills and plains. **SIMILAR SPECIES:** (1) Silverleaf Oak, though mostly more western, occurs in w. Texas and also has







### TOUMEY OAK *Quercus toumeyii* Sarg.

PL. 34

Localized on mountain slopes of se. Ariz., sw. N.M., and nearby n. Mexico, this species has the *smallest leaves* of any American oak. Leaves  $\frac{1}{2}$ –1 in. long, hairless, *shiny* above, rarely few-toothed, with *pointed tip* and rounded base. Twigs hairy; buds small, blunt, hairless. Branchlet bark flaky, *rough*. Acorns  $\frac{1}{2}$ – $\frac{5}{8}$  in. long; cup bowl-shaped. Height to 30 ft.; diameter to 1  $\frac{1}{2}$  ft. At 4000–7000 ft. elevations. **SIMILAR SPECIES:** Other local white oak species have mature leaves larger and/or branchlet bark smooth. **REMARKS:** James W. Toumey discovered the species in 1894.

### CHISOS OAK *Quercus graciliformis* C. H. Muller

NOT SHOWN

Found only in the Chisos Mts., w. Texas. Leaves *narrow*, 3–4 in. long,  $\frac{3}{4}$ –1  $\frac{1}{4}$  in. wide, thin but somewhat leathery, shiny above, hairless beneath, *drooping*, with 5–10 *large bristle-tipped teeth* or shallow lobes, or teeth lacking. Foliage hairless, long-pointed, V-based, and somewhat *copper-colored* beneath. Twigs flexible, hairy or not; buds shiny, small, hairless, and usually blunt. Acorns narrow,  $\frac{5}{8}$  in. long,  $\frac{3}{8}$  in. wide; cup saucerlike. Height to 25 ft. Rocky canyons at about 5500 ft. elevation. **SIMILAR SPECIES:** The narrow, drooping, large-toothed foliage is distinctive among Texas oaks. (1) Graves Oak (Pl. 32) has deciduous leaves with fewer and deeper lobes and hairless twigs. (2) Silverleaf Oak, also with narrow foliage, has white-hairy leaf undersides. **REMARKS:** A member of the red oak group. May hybridize with Emory Oak.

### LATELEAF OAK *Quercus tardifolia* C. H. Muller

NOT SHOWN

With leaves thick, *leathery*, and dull blue-green, this little-known evergreen red oak was once found locally in the Chisos Mts., w. Texas. It has not been found lately and its validity is in doubt.





## OAKS IV: OAKS OF THE GREAT PLAINS

### PLATE 35)

Most eastern oaks are distributed in the moist regions east of the Great Plains. A few, however, also find suitable local habitats westward. The first three of these species plus Bluejack Oak are red oaks; the remainder belong to the white oak group. Only Virginia Live Oak is evergreen. In Texas and nearby, see also Lacey, Graves, and Chisos oaks, Pl. 34.

#### EASTERN BLACK OAK *Quercus velutina* Lam. PL. 35

Reaching westward only to cen. Okla., this tree has moderately deep leaf lobes. Leaves 4–10 in. long, *thickened*, generally *glossy* above, and mostly *hairless* beneath. Twigs *angled*, *hairless*; end buds  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, *pointed*, *densely gray-hairy*, and *sharply angled*. Acorns  $\frac{5}{8}$ – $\frac{3}{4}$  in. long; cup *bowl-shaped* and *finely gray-hairy*, edge rough with fringelike scales. Trunk dark, *ridged*. Height 70–80 (100) ft.; diameter 3–4 (5) ft. Dry soils. **SIMILAR SPECIES:** (1) Shumard Oak has leaves more deeply lobed, twigs/buds *hairless*, and acorn cups shallow. See (2) Blackjack Oak.

#### BLACKJACK OAK *Quercus marilandica* Muenchh. PL. 35

A low to medium-sized tree whose range extends west to cen. Texas and w. Okla. Leaves 4–8 in. long, *thick*, *leathery*, *shallowly lobed*, *bristle-pointed*, *shiny* above, *brownish-scaly* or *hairy* beneath. Twigs *angled*, *hairy*; end buds  $\frac{1}{4}$ – $\frac{5}{16}$  in. long, *gray-hairy*, *sharp pointed*, *angled*. Acorns  $\frac{5}{8}$ – $\frac{3}{4}$  in. long. Cups somewhat *hairy*, *deep*, with a *narrowed base*, somewhat *goblet-shaped*, and with scales appearing *loosely attached*. Dark trunk bark broken into *squarish blocks*. Height 40–50 (70) ft.; diameter 1–2 (4) ft. **SIMILAR**





**SPECIES:** (1) Eastern Black Oak may have somewhat leathery leaves, but lobes are deeper and foliage and twigs are hairless. (2) Post Oak has leathery foliage and often grows with Blackjack, but leaves are more deeply lobed and not bristle-tipped.

**SHUMARD OAK** *Quercus shumardii* Buckl.

**PL. 35**

Ranging west to cen. Texas, this southern tree has leaves *deeply lobed*, 6-8 in. long, shiny above, with conspicuous tufts of hair at the vein angles beneath (lens not required). Twigs hairless; end buds clay- or *straw-colored*, more than  $\frac{1}{4}$  in. long, pointed, *hairless*, and *angled*. Acorns  $\frac{3}{4}$ -1  $\frac{1}{8}$  in. long; cups *gray*, shallow, *saucer-like*,  $\frac{3}{4}$ -1  $\frac{1}{4}$  in. in diameter. Height 70-100 (120) ft.; diameter 2-3 (6) ft. Bottomlands. **SIMILAR SPECIES:** See Eastern Black Oak. **REMARKS:** Benjamin Shumard was an early state geologist of Texas.

**BUCKLEY OAK** *Quercus buckleyi* Nixon & Dorr

**NOT SHOWN**

This recently described oak has foliage much like that of Shumard Oak but there are only *minute* hair tufts on the leaf undersides (use lens). Buds *brown*, less than  $\frac{1}{4}$  in. long, and not angled. Acorn cups *bowl-shaped*. Found along the western borders of Shumard Oak distribution from ne. Okla. to s.-cen. Tex.

**BUR (MOSSYCUP) OAK** *Quercus macrocarpa* Michx.

**PL. 35**

A tall tree found on the plains from se. Sask. to w. Okla. and cen. Texas. Though variable, foliage is usually marked by at least 1 *deep pair* of indentations that divide leaves *into* 2 or more portions. Leaves 4-10 in. long, often leathery and shiny above, usually somewhat *hairy and whitish beneath*. Twigs yellow-brown, hairless to rather hairy; end buds small, hairy, blunt, not angled. Slender *stipules* commonly present in the clustered end buds. Branchlets sometimes have *corky wings*. Acorns  $\frac{3}{4}$ -2 in. long;





cups bowl-shaped, with a peculiar “bur” or “mossy” *fringe* of elongate scales. Bark light gray, shallowly grooved. Height 70–80 (170) ft.; diameter 2–3 (7) ft. **SIMILAR SPECIES:** Fringed acorn cups and large acorns are unique. Post Oak leaves are deeply lobed but in a crosslike pattern.

**POST OAK** *Quercus stellata* Wangenh.

**PL. 35**

A small eastern tree found also throughout much of Okla. and Texas. Leaves 3–8 in. long, *often leathery*, with 3–5 large lobes usually arranged so that they resemble a cross. Leaves typically shiny above and gray or *brown-hairy beneath*. Twigs somewhat gray-hairy; end buds less than  $\frac{1}{4}$  in. long, not angled, blunt, and rather hairy. Acorns  $\frac{1}{2}$ –1 in. long. Bowl-shaped cups cover  $\frac{1}{3}$ – $\frac{1}{2}$  of acorn. Bark brownish, broken by long shallow cracks, and often divided into rectangular blocks. Height 50–60 (100) ft.; diameter 1–2 (3) ft. Dry soils. **SIMILAR SPECIES:** In winter, (1) Bur Oak has unique acorns, terminal stipules, and often winged branchlets. See (2) Blackjack Oak.

**DURAND OAK** *Quercus sinuata* Walt.

**PL. 35**

An uncommon, medium-sized tree that grows on fertile soils of the se. U.S. west to cen. Texas. Foliage *variable* from shallow lobes to merely wavy-edged. Leaves 3–8 in. long, glossy above, hairless to silver-hairy beneath. Twigs somewhat hairy; end buds under  $\frac{1}{4}$  in. long, and nearly *globular*. Acorns  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; cup *saucerlike*. Bark light gray. Height 60–90 ft.; diameter 2–3 ft. Damp to dry sites. **SIMILAR SPECIES:** Blackjack Oak also may have leaves shallowly lobed, but leaves are wide and bristle-pointed, and end buds are large, sharp, gray-hairy, and angled. **REMARKS:** Previously named *Q. durandii* Buckl. after Elias Durand of Philadelphia, a 19th-century druggist and amateur botanist.







**CHINKAPIN OAK** *Quercus muehlenbergii* Engelm. **PL. 35**

A medium-sized *upland* tree. Leaves thin, *deciduous*, 4–9 in. long with 8–13 pairs of *sharp* teeth. Leaf undersides fine-hairy. Twigs hairless. End buds narrow, *sharp*, hairless, not angled, and mostly about  $\frac{3}{16}$  in. long. Acorns  $\frac{1}{2}$ –1 in. long; cups bowl-shaped, less than 1 in. across, with tight scales free only at the tips. Bark *light gray* and often flaky, not ridged. Height 20–50 (160) ft.; diameter 6–24 in. (4 ft.) West to w. Okla., se. N.M., w. Texas, and ne. Mexico. **SIMILAR SPECIES:** (1) Virginia Live Oak may have some leaves with sharp teeth, but foliage is leathery and evergreen. See (2) Wavyleaf Oak and Fig. 5, p. 297. **REMARKS:** The leaves resemble those of the chestnut-related chinkapins (*Castanea*) of the East. Also spelled Chinquapin. A white oak species. The leaf teeth, though sharp, are not bristle-tipped.

**BLUEJACK (SAND) OAK** *Quercus incana* W. Bartr. **PL. 35**

A small tree or shrub of the southeastern states but reaching cen. Texas. Leaves smooth-edged, 2–5 in. long, and somewhat *leathery but not evergreen*. Foliage shiny and bristle-tipped, with *fine, whitish woolliness* beneath. Twigs densely woolly to nearly hairless; buds  $\frac{3}{16}$ – $\frac{5}{16}$  in. long, sharp, hairless, not angled. Acorns  $\frac{1}{2}$ – $\frac{5}{8}$  in. long, with cups saucer-shaped,  $\frac{3}{8}$ – $\frac{5}{8}$  in. across, and *short-stalked*. Trunk black or gray, bark divided into squarish blocks. Height to 35 ft. Dry soils. **SIMILAR SPECIES:** Virginia Live Oak has evergreen foliage, blunt end buds, and long acorn stalks.

**VIRGINIA LIVE OAK** *Quercus virginiana* Mill. **PL. 35**

A spreading southern *evergreen* tree of the white oak group, with *leathery* leaves. Its range extends west to cen. and s. Texas and ne. Mexico. Leaves 2–4 in. long, usually with smooth rolled edges, shiny above and mostly gray- or white-hairy beneath, sometimes





few-toothed. Leaves not bristle-tipped. Twigs are hairless, rarely gray-hairy; buds under  $\frac{1}{4}$  in. long, hairless, *blunt*, not angled. Acorns  $\frac{3}{8}$ –1 in. long, on  $\frac{3}{4}$ –1-in. stalks; cups are *bowl-shaped*. Trunk dark, bark somewhat broken into squares. Height to 60 ft.; diameter to 8 in. Mostly lowlands; sometimes thicket-forming. **SIMILAR SPECIES:** See Bluejack Oak. Many kinds of evergreen or live oaks occur farther west (Pls.

33, 34). In Texas, no other oak has leathery, smooth-edged leaves and long acorn-stalks. **REMARKS:** A shade tree in towns. Once important in producing curved timbers for ships.



## WILLOWS (PLATES 36–38)

Many willows, but not all, are easily recognized as such by the slender leaves. The single scale of the willow bud, however, forms a complete hoodlike covering and is distinctive among plants with 3 bundle scars (use lens). Many willows are only shrubs, some far-north and high-altitude species being only a few inches tall.

The tree willows are divided here into those of Pl. 36 with leaves narrow (8–15 times longer than wide), those of Pl. 37 with leaves medium-wide (5–7 times longer than wide), and those of Pl. 38 with wide leaves (only 2–4 times longer than wide). On the vigorous shoots of some species there are also small, somewhat leaflike stipules on the twigs at the bases of leafstalks. The stipules are useful in identification but may drop early. When stated to be large, they are reasonably leafy; when reported to be small, they are not evident except upon close examination.

Mature buds are listed as small when they are less than  $\frac{1}{8}$  in. long, large if they are more than  $\frac{1}{4}$  in., and medium if they are in between. The end bud is false. Twigs are said to be brittle at the base if they are easily detached, perhaps with a flick of the finger. Galls that resemble pine cones frequently grow on the twigs. The bark of tree willows is mostly yellow-ridged. Flowers and fruits are small and dry, occurring in catkins.

Identifying willows is often a difficult task even for the professional botanist. Individual variation, minute identification marks, and widespread hybridization are complicating factors. Winter characteristics are incompletely known. Final identification of



willows frequently depends on examination of the tiny flowers and fruits. Some uncertain specimens may have to be identified professionally or accepted merely as willows.

As pioneer species invading moist bare soils, willows are valuable in controlling stream-bank and mountainside erosion. Stakes of green branches will often sprout if they are merely driven into damp ground. Several willows provide long twigs used in basket-making. A great many are valued as ornamental plants. Willow bark provides tannin and a medicinal substance, salicin, the basic ingredient of aspirin. Native Americans made a tough rope from the inner bark of some species.

The wood of tree species is of some commercial value but is not highly regarded even for fuel, charcoal, or posts. Willow leaves, twigs, and buds are of importance, however, as browse for livestock. The many birds and mammals eating willow twigs, buds, leaves, or fruits include ruffed and sharptail grouse, whitetail, willow and rock ptarmigans, elk, whitetail and mule deer, moose, beaver, muskrats, snowshoe hares, and porcupines. Some willows provide nectar to honeybees.

Several trees other than willows also have narrow willowlike leaves. These are mostly shown on Pl. 39. None has the single caplike bud scale of willows. While sycamores (Pl. 29) have similar single bud scales, their leaves are fan-lobed and trunks are light-barked and usually mottled.

## WILLOWS I: LEAVES VERY NARROW (PLATE 36)

The *very narrow* leaves of these willows are 8–15 times longer than wide. They are mostly 3–5 in. long, toothed, long-pointed, deciduous, V-based, and without stipules or leafstalk glands. There are exceptions, however, as noted.







Twigs hairy, often whitish. Height to 25 ft. Moist soils to 1000 ft. elevation. **SIMILAR SPECIES:** (1) Sandbar and (2) River willows have leaves narrower or at least not as elliptical as in this species.

**RIVER WILLOW** *Salix fluviatilis* Nutt.

**PL. 36**

Reported only from the lower valleys of the Columbia and Willamette rivers in Ore. and Wash., this willow has long-pointed leaves 3–6 in. long,  $\frac{5}{16}$ – $\frac{1}{2}$  in. wide, *toothed*, *whitened*, and *silky-hairy* to hairless beneath. Leafstalks short or lacking. Twigs essentially hairless. Height to 25 ft. **SIMILAR SPECIES:** (1) Sandbar Willow has more slender leaves usually with fewer teeth. (2) Northwest Willow has shorter and wider leaves not whitened beneath and with few teeth or none. **REMARKS:** None of our other tree willows has such a localized distribution..

**BLACK WILLOW** *Salix nigra* Marsh.

**PL. 36**

Distributed across the southwestern states and n. Mexico to range widely in Texas and e. N. America. Leaves 2–6 in. long,  $\frac{1}{4}$ – $\frac{5}{8}$  in. wide, *fine-toothed*, *green on both sides*, shiny above, paler beneath, hairless, long-pointed, V-based, with stipules usually conspicuous. Leafstalks  $\frac{1}{8}$ – $\frac{5}{16}$  in. Twigs hairless and usually *brittle* at the base; buds small. Height 30–100 ft.; diameter 1–3 ft. To 5000 ft. elevation. **SIMILAR SPECIES:** In our area, only this and Goodding Willow are narrow-leaved with foliage hairless and green







on both sides. Goodding Willow has bud scales not fused. See (2) Coastal Plain Willow (Pl. 37). **REMARKS:** The largest of our willows but providing commercial lumber only in southeastern states. Wood used to make polo balls as well as barrels, doors, and furniture.

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**GOODDING WILLOW** *Salix gooddingii* C. Ball **NOT SHOWN**

Similar to Black Willow but with leafstalk *glands* present, the twigs yellowish and *hairy*. Also unlike most willows, the margin of the single bud scale is *not* fused but appears as a line on the surface of the otherwise smooth bud scale. A tree of the southwestern states and nearby Mexico. **SIMILAR SPECIES:** Red Willow (p. 323), also with a visible bud scale margin, has twigs reddish plus foliage less narrow and whitened beneath. **REMARKS:** Previously included as a part of Black Willow. Also called Goodding Black Willow. Native Americans are reported to have woven the twigs/branchlets into baskets that could hold water.

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**SATINY WILLOW** *Salix pellita* Anderss. ex Schneid. **PL. 36**

Mainly a tree of e. Canada, this willow occurs west to cen. Sask. Leaves 2–5 in. long,  $\frac{1}{4}$ – $\frac{3}{4}$  in. wide, somewhat leathery, and mostly *without teeth*. Foliage *short-pointed*, whitened and silky-hairy beneath, with stipules small or lacking. Leaf undersides and twigs white-powdered. Leafstalks  $\frac{1}{4}$ – $\frac{3}{8}$  in. long. Twigs hairless; buds of medium size. Height to 30 ft. **SIMILAR SPECIES:** Sandbar Willow has leaves only  $\frac{1}{8}$ – $\frac{3}{8}$  in. wide, long-pointed, and usually with a few teeth. **REMARKS:** Also called Ontario Willow.





## WEeping WILLOW *Salix babylonica* L.

PL. 36

An Old World tree with *extremely long*, brittle-based twigs and branchlets that *hang vertically*, often sweeping the ground or overhanging a lake or stream. Leaves moderately narrow, 1–5 in. long,  $\frac{1}{4}$ – $\frac{1}{2}$  in. wide, hairless or silky, fine-toothed, long-pointed, whitened beneath. Leafstalks under  $\frac{1}{4}$  in. long. Small leafstalk glands may be present. Twigs sometimes silky; buds of medium length. Stipules small or lacking. Height 30–50 (60) ft.; diameter 1–3 (5) ft. Flowers April–May. Planted widely. **SIMILAR SPECIES:** Short leafstalks and extreme weeping characteristics distinguish this willow from other cultivated willows with weeping growth habits. **REMARKS:** Originally from China.

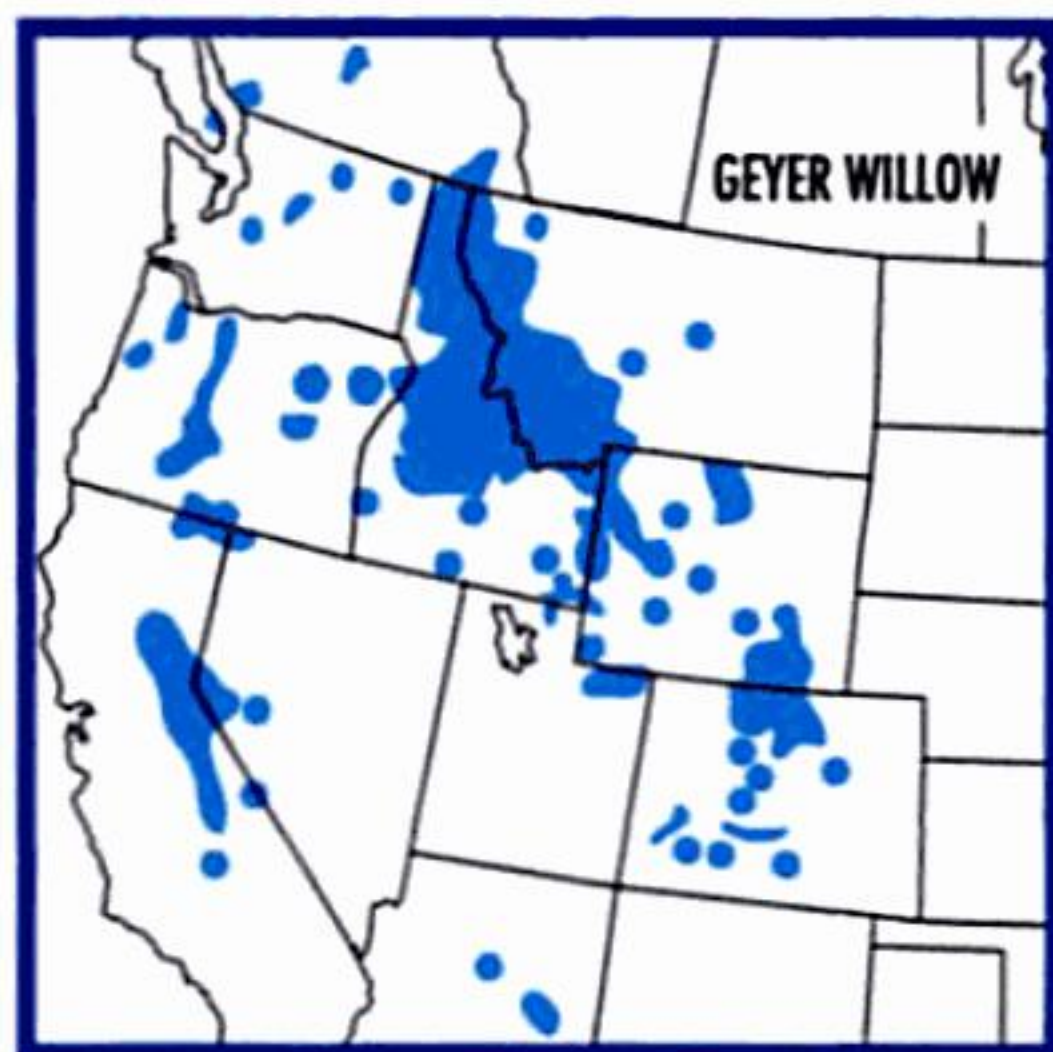
## WILLOWS II: LEAVES OF INTERMEDIATE WIDTH (PLATE 37)

Willows shown on this plate have *medium-wide* leaves (5–7 times longer than wide). They are mostly fine-toothed and without stipules or leafstalk glands (but see exceptions). Northwest Willow (Pl. 36) in the Pacific Northwest and Littletree Willow (Pl. 38) in Alaska and nw. Canada sometimes also have leaves of intermediate width. See Pl. 39 for similarly leaved nonwillows.

## WHITE WILLOW *Salix alba* L.

PL. 37

Our only willow with leaves usually *whitish above and below*. European in origin but widely planted for ornament. Leaves 2–6 in. long,  $\frac{3}{8}$ – $1\frac{1}{4}$  in. wide, mostly long-pointed, V-based, fine-toothed, *gray-green* above, whitened and silky-hairy beneath. Leafstalks *hairy*, glands *present* at the leaf bases, stipules mostly lacking. Twigs nearly hairless to silky; buds of medium length. Height to 80 ft.







*Bark of Pacific Willow*

**MEADOW WILLOW** *Salix petiolaris* J. E. Smith **PL. 37**

Primarily Canadian, this shrub or tree stretches across the continent from e.-cen. Alta. to the Atlantic Ocean and occurs locally in Colo., S.D. (Black Hills), and Neb. Leaves 2–4 in. long,  $\frac{3}{8}$ – $\frac{3}{4}$  in. wide, toothed, V-based, *long-pointed*, *shiny*, *dark green* above, whitish and hairless beneath. Stipules small or lacking. Young leaves become *black* upon drying. Leafstalks  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, *without* glands. Twigs dark, hairless, and mostly clustered near branchlet ends; buds of medium length. Height to 25 ft. **SIMILAR SPECIES:** In the prairie provinces of Canada, (1) Shining Willow (Pl. 38) has leafstalk glands present and  $\pm$  wider foliage that does not blacken upon drying. See (2) Mackenzie Willow.

**GEYER WILLOW** *Salix geyeriana* Anderss. **PL. 37**

A willow of the Pacific slope, Ariz., and the Rockies with leaves 1–3 in. long,  $\frac{3}{8}$ – $\frac{1}{2}$  in. wide, V-based, mostly *without teeth*, and often *blunt-tipped*. Foliage is dull dark green above and somewhat whitened and often silky beneath. Stipules small or lacking. Leafstalks only  $\frac{1}{8}$ – $\frac{3}{8}$  in. long, without glands. Twigs hairless, usually with a *white bloom*; buds small. Height to 15 ft. **SIMILAR SPECIES:** (1) The foliage of Pacific Willow bears leafstalk glands and is





toothed, long-pointed, long-stalked, and mostly U-based. (2) Arroyo Willow has thicker leaves more or less leathery. Its twigs are yellowish, somewhat hairy, and lack a powdery bloom. See (3) Scouler Willow, Pl. 38. **REMARKS:** Karl Geyer, a German botanist, collected plants from Mo. to the West Coast in the 1840s.

## PACIFIC WILLOW

PL. 37

*Salix lucida* ssp. *lasiandra* (Benth.) E. Murray

Ranging throughout the northern and western mountains. Leaves 2–6 in. long,  $\frac{1}{2}$ –1 in. wide, *finely toothed*, *very long-pointed*, *shiny* dark green above, hairless, and *whitened* beneath with a waxy bloom. *Glands* present on the upper leafstalks or on the mostly *U-shaped* leaf bases. Leafstalks  $\frac{1}{2}$ – $\frac{3}{4}$  in. long. Twigs purple to yellow, hairless; buds large. Height to 60 ft.; diameter to 3 ft. Wet to moist soils. **SIMILAR SPECIES:** Leafstalk glands, long leafstalks, and  $\pm$  U-shaped leaf bases are unlike other willows of this group. See Shining Willow (Pl. 38). **REMARKS:** Once used widely to make charcoal. Formerly known as *S. lasiandra*; now classified as a subspecies of Shining Willow (Pl. 38). Also linked with Pacific Willow, ssp. *caudata* (Nutt.) Sudw.; ranges mainly in the Rockies and nearby with non-whitened foliage and other characteristics intermediate between its Pacific Willow and Shining Willow relatives.

## ARROYO WILLOW *Salix lasiolepis* Benth.

PL. 37

A variable willow with its major range along the Calif. coast but also scattered locally throughout much of the mountainous w. U.S. Leaves 2–5 in. long,  $\frac{1}{2}$ –1 in. wide, often thick and rather *leathery*, with few or *no* teeth, hairless or not, dark shiny green above, whitish beneath, V-based, and short-pointed to *blunt* at the tip. Leafstalks  $\frac{1}{8}$ – $\frac{3}{4}$  in. long, without glands, often *hairy*. Twigs yellowish, mostly hairy; buds large. Height to 30 ft. Stream banks.





## WILLOWS III: LEAVES RELATIVELY WIDE (PLATE 38)

These willows have moderately *broad* leaves mostly 2–4 times longer than wide. Except for Shining Willow, they are whitened beneath, mostly long-stalked, and lack leafstalk glands and long-pointed leaf tips. Several species always lack leaf teeth; others are variably without them. None is evergreen. Most are northern species. See also Pls. 36, 37, 39.

### SHINING WILLOW *Salix lucida* Muhl. ssp. *lucida* PL. 38

From ne. N. America this tree ranges west to e. Sask. and, locally, in the Dakotas. Leaves 2–6 in. long,  $\frac{1}{2}$ –1  $\frac{1}{2}$  in. wide, fine-toothed, shiny, hairless, *long-pointed*, mostly V-based, and sometimes pale but *not* whitened beneath. Stipules large, usually present. Leafstalk glands present. Twigs dark, hairless, and brittle-based; buds medium. Height 10–15 (25) ft.; diameter 1–6 (12) in. **SIMILAR SPECIES:** The only willow of this plate with either leafstalk glands or long-pointed foliage. Among willows with leaves of medium width (Pl. 37), (1) Meadow Willow has foliage becoming black on drying, while (2) Peachleaf Willow has leaves not shiny. Neither species displays leafstalk glands. **REMARKS:** Pacific Willow, and an associated form (p. 322), are now judged to be western subspecies of Shining Willow.

### PUSSY WILLOW *Salix discolor* Muhl. PL. 38

Ornamental in spring when the furry catkin buds grow large, this willow ranges across Canada from cen. B.C. and Lab. south to Idaho, sw. S.D., e. Tenn., and N.J. Leaves 2–5 in. long,  $\frac{1}{2}$ –1  $\frac{1}{2}$  in. wide, mostly *coarse-toothed*, short-pointed, blue-green, whitened beneath, mostly *hairless*, U- or V-based, and with large stipules







30 ft. in favored locations in Alaska/Yukon area. **SIMILAR SPECIES:** (1) Hooker Willow, also white-woolly, occurs only near the coast, its leaves often toothed and with U-shaped bases. (2) Bebb Willow may have leaves without teeth but foliage is gray-hairy. **REMARKS:** See under Littletree Willow. The specific name refers to Alaska.

## SITKA WILLOW *Salix sitchensis* Bong.

PL. 38

A tree of northern coasts that also occurs locally inland to the n. Rockies. Leaves 2–4 in. long,  $\frac{3}{4}$ –1  $\frac{1}{2}$  in. wide, *not* toothed, blue-green, V-based, *shiny*, *white-silky* beneath, the edges *rolled under*. Leaf tips short-pointed or blunt. Stipules usually evident. Twigs white-hairy or hairless and brittle at the base; buds large. Height to 30 ft. **SIMILAR SPECIES:** The undersides of mature leaves have a distinctive silver-satiny appearance and touch that is unlike that of other willows.



*Scouler Willow*





stipules sometimes present. Leafstalks  $\frac{1}{4}$ – $\frac{3}{8}$  in. Twigs stout, *gray-hairy*, and easily detached at the base; buds large, dark, hairy. Height to 30 ft. Stream mouths, lagoons, and sand dunes within a few miles of the ocean, to 500 ft. elevation from near Anchorage, Alaska, to n. Calif. **SIMILAR SPECIES:** (1) Feltleaf Willow has wedge-based leaves that are not toothed. Its woolly twigs are a more brilliant white. Near the Ore.-Calif. border, (2) Tracy Willow has smaller and less hairy foliage. **REMARKS:** Rapidly invades burned areas. William J. Hooker was a British botanist who published a 19th-century book on the flora of n. North America.

## TRACY WILLOW *Salix tracyi* Ball

PL. 38

Native only in extreme sw. Ore. and nw. Calif. Leaves blue-green,  $1\frac{1}{4}$ –2 in. long,  $\frac{1}{2}$ – $\frac{3}{4}$  in. wide, mostly without teeth, *V-based*, widest toward the tip, whitened and often somewhat hairy beneath, and short-pointed or blunt-tipped. Leafstalks under  $\frac{1}{4}$  in. Twigs slender, hairless. Height to 20 ft. Stream sandbars to 500 ft. elevation. **SIMILAR SPECIES:** See Scouler and Hooker willows. **REMARKS:** Recent study holds that this plant is not distinct from Arroyo Willow (Pl. 37).

## NONWILLOWS WITH NARROW WILLOWLIKE LEAVES (PLATE 39)

Many willows have leaves slender or nearly so (Pls. 36, 37). Other willows have wider foliage (Pl. 38). Some plants other than willows, however, also have alternate, thin leaves 3–15 times as long as wide. These include the species of this plate as well as Narrowleaf Cottonwood (Pl. 31) plus Fire and Black cherries (Pl. 42). A few additional trees have narrow evergreen leaves that are thick, leathery, and sometimes slender (see oaks, Pls. 33, 34; Ari-





zona Madrone, Pl. 45; and Bluegum Eucalyptus, Pl. 46). *None* of the narrow-leaved nonwillows, however, has the distinctive buds (with a single, smooth, caplike scale) characteristic of willows. The first five species of this group are evergreen.

## CALIFORNIA-BAY

PL. 39

*Umbellularia californica* (Hook. & Arn.) Nutt.

Coastal Calif. and sw. Ore. plus the w. slopes of the Sierra Nevada are the home areas of this broad-leaved *evergreen* tree. Leaves 3–5 in. long,  $\frac{3}{4}$ –1 in. wide, short-pointed to blunt-tipped, mostly V-based, yellow-green and shiny above, *pale beneath*, hairless, leathery, *without* teeth, and strongly *spicy-scented* when crushed. Leafstalks *only*  $\frac{1}{8}$ – $\frac{1}{4}$  in. long. Twigs green and (like the leaves) aromatic when crushed. Buds small, *without* scales. Flowers small, yellow, in clusters at the leaf bases, Dec.–April. Fruits greenish purple,  $\frac{3}{4}$ –1 in. long, seed large, pulp thin, Oct. and later. Height 30–80 ft.; diameter 1–3 ft. Fertile soils, to 6000 ft. elevation. **SIMILAR SPECIES:** Golden Chinkapin has nonaromatic leaves with yellow undersides. **REMARKS:** The generic name refers to the umbrellalike flower clusters. Sometimes called California-laurel or Oregon-myrtle. Leaves are used in cooking to provide flavor. Wood was made into fine furniture when large trees were more available;



*Bark of California-bay*





now used mostly for candlesticks and small woodenware. Squirrels and Steller's jays eat the fruits.

## GOLDEN CHINKAPIN

PL. 39

*Chrysolepis chrysophylla* (Dougl. ex Hook.) Hjelmq.

A large *evergreen* tree mostly of coastal regions from sw. Wash. to cen. Calif. and locally in the Sierra. Leaves dark green, much like California-bay but *not* spicy-scented, the tips *sharp*, short- or long-pointed, mostly V-based, and the undersides *golden yellow*. Twigs mostly yellow-scaled like the leaves; buds scaly and *clustered* at the twig ends. Flowers tiny, whitish; male blossoms in catkins, female ones in small groups, both at the leaf angles, May–June. Fruits prickly burs 1–1½ in. long, 4-parted and containing 1–3 nuts that require two years to mature. Stumps sprout after fires. Height 50–80 (130) ft.; diameter 1–3 (4) ft. Mountain forests to 10,000 ft. elevation. **SIMILAR SPECIES:** (1) Canyon Live Oak (Pl. 33) has clustered end buds and sometimes yellow leaf undersides, but leaves are smaller, often prickly, and fruits are acorns. (2) See California-bay. **REMARKS:** Not an important timber tree, though wood is strong. Browsed by mule deer. Believed to sometimes attain an age of 500 years. Related to the Chestnut and chinkapins (*Castanea*) of e. N. America, but they have toothed deciduous leaves. This western relative is reported also to be susceptible to the chestnut blight, a fungal disease that has nearly exterminated the Chestnut (*C. dentata* [Marsh.] Borkh.) in the East. The generic name formerly was *Castanopsis*.

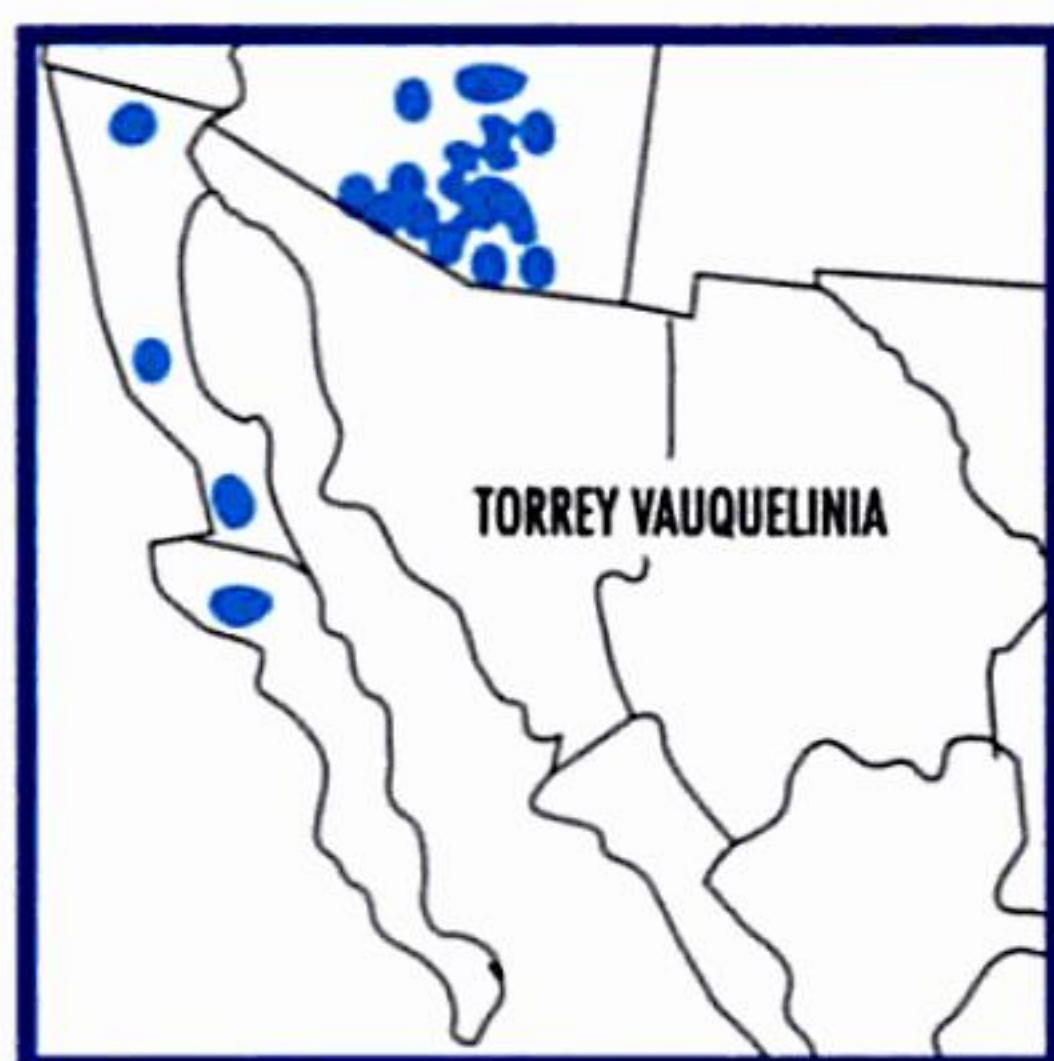
## PACIFIC BAYBERRY *Myrica californica* Cham.

PL. 39

Distributed naturally only near the coast, this species occurs from sw. Wash. to s. Calif. Leaves 3–4 in. long, ¼–1 in. wide, *evergreen*, *coarse-toothed* (sometimes without teeth), *short-pointed*, *hairless*, and *crowded* toward the twig tips. Foliage also shiny above, *narrowly wedge-based*, widest above the middle, often with scattered black or yellow resin dots beneath (use lens), and somewhat *aromatic* when crushed. Twigs hairy or not; bud scales several, red-brown. Flowers tiny, greenish, without petals, in *catkins* about 1 in. long at the leaf angles, spring. Fruits ⅛–¼ in. in diameter,







in. in diameter, Aug.–Oct. Damp, sandy soils. **REMARKS:** A honey plant. Leaves have been used to flavor soups and other foods. It is said that a blue dye can be made from water used to melt bayberry wax. Reportedly, this water was also used to treat dysentery. Fruits are consumed by many birds including bobwhite quail and ruffed grouse.

## TORREY VAUQUELINIA

PL. 39

*Vauquelinia californica* (Torr.) Sarg.

Despite the specific name, only s. Ariz. and Baja California are home areas for this shrub or small tree. Leaves 2–4 in. long,  $\frac{1}{4}$ – $\frac{1}{2}$  in. wide, leathery, *evergreen*, *hairy* beneath, with somewhat *parallel coarse-toothed* margins, V-shaped bases, and short-pointed tips. Twigs and buds hairy. Flowers small, white, in broad twig-end clusters, June. Fruits dry, egg-shaped, hairy capsules, about  $\frac{1}{4}$  in. long, Aug. Height to 20 ft. Mountain slopes and canyons, to 5000 ft. elevation. **SIMILAR SPECIES:** Desert-willow leaves are deciduous, much longer, and not toothed. **REMARKS:** Boundaries of far western states were not well defined when the species was named. Wood is heavy, close-grained, and reddish. Also called Arizona Rosewood. N. L. Vauquelin was an 18th-century French chemist.

## JUMPING-BEAN SAPIUM

PL. 39

*Sapium biloculare* (Wats.) Pax.

Found only in sw. Ariz. and nw. Mexico. Like most other members of the Euphorbia family, the sap is *milky*, irritating to touch, dangerous to the eyes, and *poisonous* to swallow. Leaves 1–2 in. long,  $\frac{3}{8}$ – $\frac{5}{8}$  in. wide, deciduous, *fine-toothed*, often *crowded at twig ends*, U-based, short-pointed or blunt, and not evergreen. Twigs hairless and often *spurlike*, roughened by crowded leaf scars; bundle scar 1. Flowers tiny, without petals, in slender spikes at twig ends,







March–Nov. Fruits 2-lobed dry capsules about  $\frac{1}{2}$  in. long, containing a mottled seed. Height to 20 ft. Desert gullies and streambeds to 2500 ft. elevation. **SIMILAR SPECIES:** None of our other willowlike trees has roughened spur branches or milky sap. Tallowtree (p. 286) is related. **REMARKS:** One of several southwestern and Mexican plants with seeds inhabited by insect larvae whose actions may cause the seed to move. Parts of the plant have been used to anesthetize fish, but this is now illegal. Native Americans are reported also to have poisoned their arrows with the sap.

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DESERT-WILLOW *Chilopsis linearis* (Cav.) Sweet

PL. 39

This nonwillow with long and *very narrow* leaves occurs from s. Calif., sw. Utah, and w. Texas south into n. Mexico. Leaves 3–7 in. long and *narrow*, only  $\frac{1}{8}$ – $\frac{1}{4}$  in. wide, *parallel-sided*, long-pointed, V-based, hairless, *deciduous*, and *without* teeth. Some leaves and leaf scars (mostly on low branches) may be opposite or in whorls of 3. Twigs long, slender, hairless; buds tiny, at right angles to twigs; end bud false. Bundle scar 1. Flowers showy, 1–1½ in. long, white to purple, in twig-end clusters, April–Aug. Fruits slender, brown, dry, *podlike* capsules 4–12 in. long, splitting in autumn to release small winged seeds; pale capsule remnants often remain in winter. Sprouts after being cut. Height to 35 ft. Desert washes. **SIMILAR SPECIES:** (1) Russian-olive has much shorter leaves and is silver-scaled overall. (2) See also Torrey Vauquelinia. **REMARKS:** Frequently planted for ornament. Sometimes used for fence posts. Common in Joshua Tree National Park, Calif.

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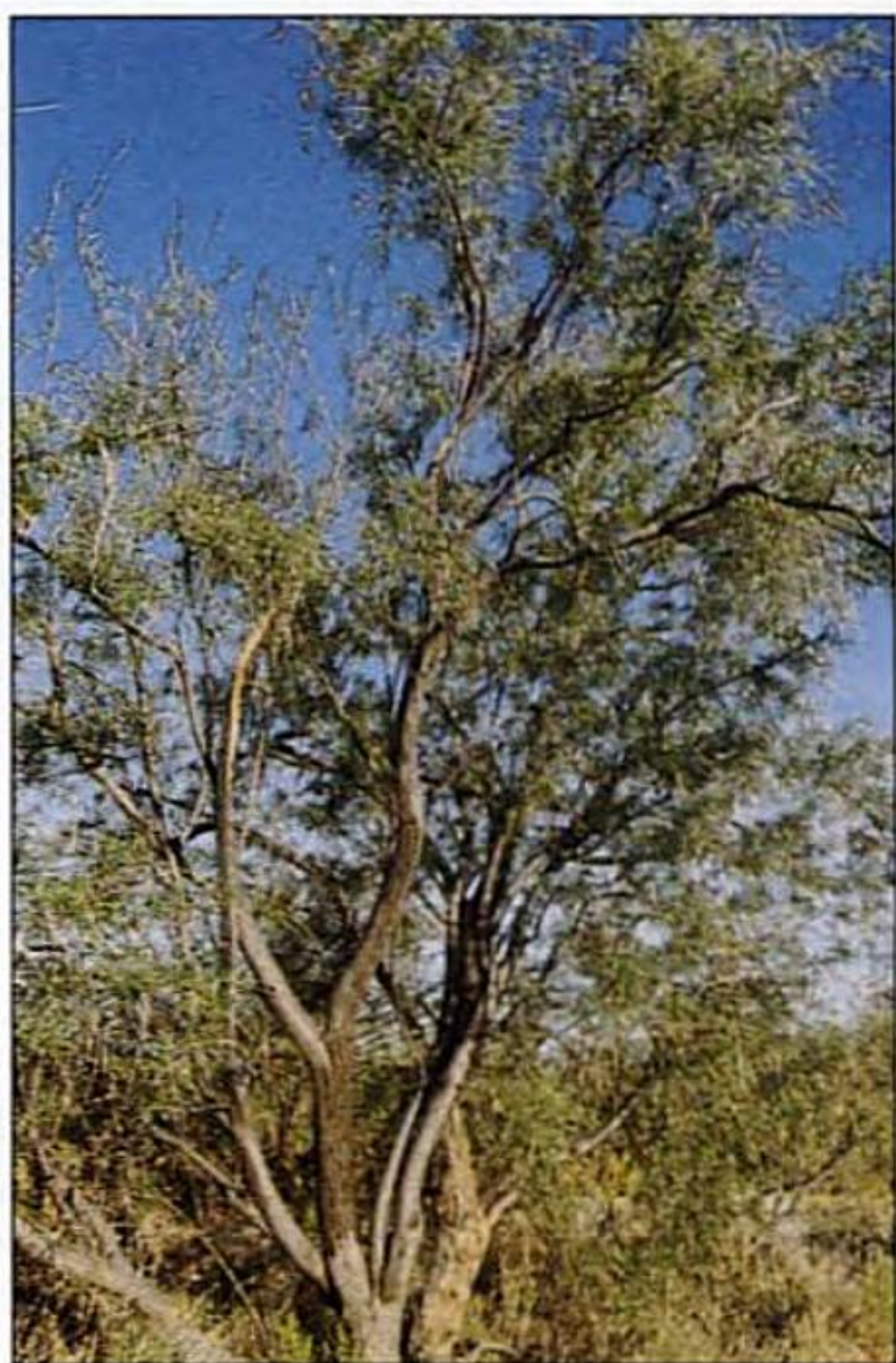
RUSSIAN-OLIVE *Elaeagnus angustifolius* L.

PL. 39

A drought-hardy species introduced from Eurasia and planted widely. Leaves 1–4 in. long,  $\frac{1}{2}$ –1 in. wide, dark green above, *silver-*







*Desert-willow*

*scaled beneath*, U- or V-based, short-pointed, and *without* teeth. Twigs *silver-white*; branchlets brown; bud scales 2–4; bundle scar 1. May be thorny. Root sprouts common. Flowers small, yellowish, at leaf angles, spring. Fruits  $\frac{1}{2}$  in. long, egg-shaped,  $\pm$  fleshy, silver-red to white in winter. Mature bark brown. Height to 25 ft. Hedgerows and ornamental plantings. **SIMILAR SPECIES:** Silver Buffaloberry (Pl. 17) also is silvery and often thorny, but it has opposite leaves. **REMARKS:** Not related to the Old World cultivated olive (*Olea europaea* L.). Often called Oleaster. Frequently planted on plains areas as a windbreak and in towns as an ornamental. Fruits are eaten by fox squirrels, sharptail grouse, ringneck pheasants, and many songbirds.

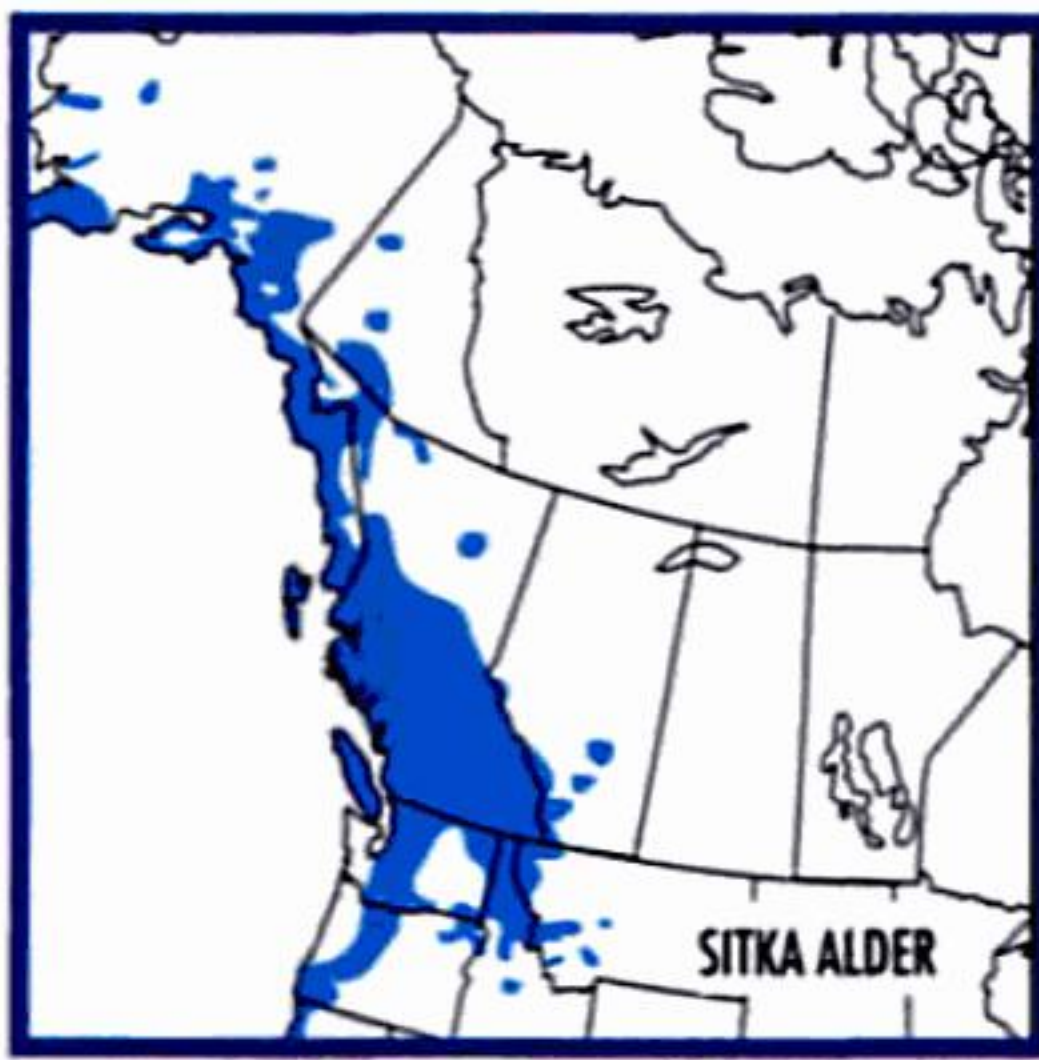
#### **PEACH** *Prunus persica* Batsch

**PL. 39**

Occasionally escaping from cultivation mainly in the e. U.S. and Calif. Leaves 3–6 in. long,  $\frac{5}{8}$ –1 in. wide, *finely sharp-toothed*, hairless, variably U- or V-based, and *long-pointed*. Twigs hairless, spur branches present, buds hairy, bundle scars 3. Flowers  $\frac{1}{2}$ –1 in. long, pink, appearing singly or in pairs along the branchlets before the leaves, spring. Fruits *velvety*, yellow, fleshy, tasty; seeds pitted. Trunk mostly marked with horizontal streaks. Height to 25 ft. **SIMILAR SPECIES:** See cherries, Pl. 42.







to 3 ft. Streamsides and canyons to 8000 ft. elevation; mostly absent from the coastal strip occupied by Red Alder. **SIMILAR SPECIES:** (1) Red Alder has leaves deeply and rather coarsely double-toothed with leaf edges rolled under. (2) Mountain Alder foliage also is deeply double-toothed but with only 6–9 pairs of side veins and edges flat. (3) Sitka Alder has leaves shiny beneath and buds pointed. **REMARKS:** Wood of value mainly as firewood.

## SITKA ALDER

PL. 40

*Alnus viridis* ssp. *sinuata* (Regel) A. Löve & D. Löve

Ranging from n. Alaska to n. Calif. and nw. Wyo., this species resembles the previous two. Leaf undersides often shiny and sticky, however, and teeth *finely long-pointed* (use lens). Foliage double-toothed with 6–10 pairs of main veins. Mature buds  $\frac{3}{8}$ – $\frac{1}{2}$  in. long, *sharp-pointed*, *resinous*, essentially *not* stalked, and with 4–6 *overlapping* scales. Cones  $\frac{5}{8}$ –1 in. long and, unlike our other alders, mostly on *thin* ( $\frac{1}{32}$  in. or less) stalks, each *as long as the cones*. Trunk bark gray. Height to 35 ft.; diameter to 10 in. Snowslide areas, stream banks and clearings to 7000 ft. elevation.

**SIMILAR SPECIES:** Buds with 4–6 scales and  $\pm$  not stalked, leaf undersides shiny, long-pointed leaf teeth, and thin, long-stalked cones are all unique characteristics among our tree alders. Only Seaside Alder of Okla. and Md.-Del. also has overlapping bud scales.

**REMARKS:** Often confused with shrubby Green Alder (*A. viridis* ssp. *crispa* [Ait.] Turr.) at interior far-northern locations. Green Alder leaves, while also having fine long-pointed teeth, are distinguished by their single- rather than double-toothed edges. Green Alder is sometimes also called Mountain Alder (but see next species).







## MOUNTAIN ALDER

PL. 40

*Alnus incana* ssp. *tenuifolia* (Nutt.) Breit.

A tree of cold climates and medium to high elevations, distributed from cen. Alaska and nw. Canada south in the mountains to cen. Calif., se. Ariz., and w. N.M. Leaves 1–3 in. wide, *finely* and often deeply *double-toothed*, *dull* green beneath, with 6–9 pairs of major side veins, and edges *flat*. Leaf undersides have veinlets in an irregular *network* and *not* regularly parallel (use lens). Mature buds  $\frac{1}{4}$ – $\frac{3}{8}$  in. long, *blunt*, slightly resinous, some with bases not stalked. Cones  $\frac{3}{8}$ – $\frac{5}{8}$  in. long. Trunk brown or gray with horizontal bars (lenticels). Height to 30 ft. Wet sites, on lowlands in the north but to 10,000 ft. elevation farther south. **SIMILAR SPECIES:** Mountain Alder probably is best identified by elimination. It lacks the rolled leaf edges, more numerous veins, and whitish leaf undersides of (1) Red Alder and the shiny leaf undersides and stalkless pointed buds of (2) Sitka Alder. Unlike (3) White Alder, its leaves are more deeply double-toothed and have only 6–9 pairs of major veins. It lacks the ladderlike pattern of veinlets found in Canada's (4) Speckled Alder and the narrow foliage of (5) Arizona Alder. **REMARKS:** Also known as Thinleaf Alder, a translation of the subspecific name.

## SPECKLED ALDER *Alnus rugosa* (Du Roi) Spreng.

PL. 40

Primarily a Canadian tree nearly crossing the continent from the Yukon and cen. B.C. to Lab., Nfld., and ne. U.S. Similar to Mountain Alder, but the tiny veinlets are raised, regularly parallel, and *ladderlike* on leaf undersides (use lens). Side veins are 9–12 pairs. Trunk bark brown, smooth, with horizontal marks (lenticels). Cones  $\frac{1}{4}$ – $\frac{5}{8}$  in. Height 20–30 ft.; diameter to 6 in. **REMARKS:** See Remarks under Mountain Alder.



Much like Mountain Alder but growing to a *larger* size. It differs also in that it has leaves *narrowly* egg-shaped with 9–13 side veins, leaf bases mostly *V-shaped*, and buds *about*  $\frac{1}{2}$  in. long. Bark of large trees is *checkered*, broken into small plates. Cones  $\frac{3}{8}$ – $\frac{3}{4}$  in. Height to 60 ft.; diameter to 3 ft. Said to be more common than Mountain Alder in Ariz. and w. N.M. Also extends into n. Mexico.

SEASIDE ALDER *Alnus maritima* (Marsh.) Muhl. ex Nutt. PL. 40

A rare tree recorded in the West only in Johnston and Pontotoc counties, Okla. Leaves 1–2½ in. wide, narrowly elliptical, *pointed at both ends, singly and coarsely toothed*, glossy and with 5–7 pairs of side veins. Bud scales narrow and *distinct*, the edges *not* joining. Cones  $\frac{3}{8}$ – $\frac{3}{4}$  in. Flowers in *late summer*. Height to 30 ft.; diameter to 6 in. Also occurs in coastal districts of Md. and Del. **REMARKS:** Fossil evidence indicates that the separate populations are survivors from a more widespread distribution in earlier geologic time.

## OTHER TREES WITH ALTERNATE LEAVES MOSTLY DOUBLE-TOOTHED (PLATE 41)

In addition to alders (Pl. 40) and some cherries (Pl. 42), the western birches, hornbeams, and elms also have deciduous, more or less egg-shaped, and (except for Siberian Elm) *double-toothed* leaves. All have 3 bundle scars (but see California Hazelnut), false end buds, and inconspicuous blossoms.

These birches, hornbeams, and hazelnuts are closely related catkin-bearing trees with smooth, *even-based* leaves (except California Hazelnut) and *non-fibrous* inner bark. The birches have distinctive smooth white or brown bark with *horizontal streaks* (lenticels), hairless buds with only 2–3 scales, and tiny, crowded, dry fruits along an often persistent stem. Short *spur branches* of densely clustered leaves and leaf scars are usually present. Hornbeams and California Hazelnut have rough, gray-brown trunks, 6–8 bud scales, and no spur branches. The springtime flowers of hornbeams develop into unusual papery, inflated, bladderlike fruits that contain small nutlets. Those of the hazelnut grow into long-beaked nuts.

Elms have dark, furrowed trunks and generally *uneven-based, often sandpapery* leaves. Their buds have 6–8 scales, flowers are inconspicuous, and fruits are small, winged, papery, oval to circu-







*Bark of Paper Birch*

lar, and single-seeded. Unlike other trees with similar foliage, the inner bark of both branches and roots is tough and *fibrous*. Starting with a small cut, it can be peeled in strips to assist in identification and twisted into emergency fishlines, nets, or snares. Elm wood is difficult to split.

**PAPER BIRCH** *Betula papyrifera* Marsh.

**PL. 41**

Distributed from Alaska, transcontinental across Canada and with southward extensions into the n. Rockies and nearby areas plus the ne. U.S. The *white trunk* with dull, *peeling* outer layers and thin, dark, horizontal *lines* is distinctive. Leaves 2–4 in. long, mostly *long-pointed*, and with 5–9 pairs of rather parallel and  $\pm$  hairy side veins. Twigs *slightly* rough-warty or smooth. Buds *blunt*. Flowers spring. Fruiting catkins slender,  $\frac{1}{4}$  in. wide, and 1  $\frac{1}{2}$  in. long, Aug.–Sept. Height 70–80 (120) ft.; diameter 1–3 (4) ft. Open woods, cutover areas. **SIMILAR SPECIES:** See next three species. In addition, Quaking Aspen, and sometimes other poplars (Pl. 31), have yellowish to white smooth trunks. Their bark does not peel, however, or have horizontal streaks. See also Red Alder (Pl. 40). **REMARKS:** Birch bark has been used by Native Americans for canoe and wigwam coverings (tied in place with spruce rootlets), boxes, cups, makeshift shoes, and emergency snow goggles. They,





as well as early French-Canadian voyageurs, used the springtime sap as a refreshing drink and also boiled it into a sweet syrup. The curled outer bark is highly flammable and provides tinder even when damp. Deeper bark should not be taken from living trees as it leaves black scars. Leaves have been used for tea but are not as peppermint-scented as those of the eastern Sweet (*B. lenta* L.) and Yellow (*B. alleghaniensis* Britton) birches. Paper birch lumber is used for woodenware, pulp, and fuel. Seeds and buds are eaten by ruffed and sharptail grouse as well as by numerous songbirds. Twigs are cropped by moose, deer, mountain goats, and snowshoe hares. Beavers and porcupines consume the inner bark. See Remarks under Water Birch.

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**ALASKA WHITE BIRCH** *Betula neoalaskana* Sarg. **NOT SHOWN**

Otherwise resembling Paper Birch, this tree has leaves  $\pm$  hairless and twigs *densely* covered with *large* resin-glands. Height to 80 ft. Distributed from n. cen. Alaska to nw. Ontario.

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**KENAI BIRCH** *Betula kenaica* Evans **NOT SHOWN**

A northern brown- to white-barked birch with leaves less than 2 in. long, 2-6 pairs of side veins, and *few small* twig-glands. To 35 ft. tall. Ranges from w. Alaska to w.-cen. Yukon.

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**WEeping BIRCH** *Betula pendula* Roth **NOT SHOWN**

Much like Paper Birch but with twigs/branchlets pendent and the trunk bark *glossy* white, black-fissured at the base, sometimes peeling in lengthy strips. Leaves 1-3 in. long,  $\pm$  hairless, and (like the twigs) with *small* resin-dots. Twigs hairless,  $\pm$  smooth. Height to 40 ft. A landscape tree naturalized in Washington State and perhaps elsewhere. Also known as European White Birch.





*dentata* [Marsh.] Borkh.), also of the e. U.S., similarly was decimated by a disease introduced from overseas. Now stands of dead American Elms occupy lowland sites in many places. "Dutch" elm disease is a fungus spread by a beetle. Seeds are eaten by bob-white quail, European partridge, ruffed grouse, prairie chicken, gray and fox squirrels, and opossum. Cottontail rabbits, snowshoe hares, and white-tailed deer browse the twigs.

**SLIPPERY ELM** *Ulmus rubra* Muhl.

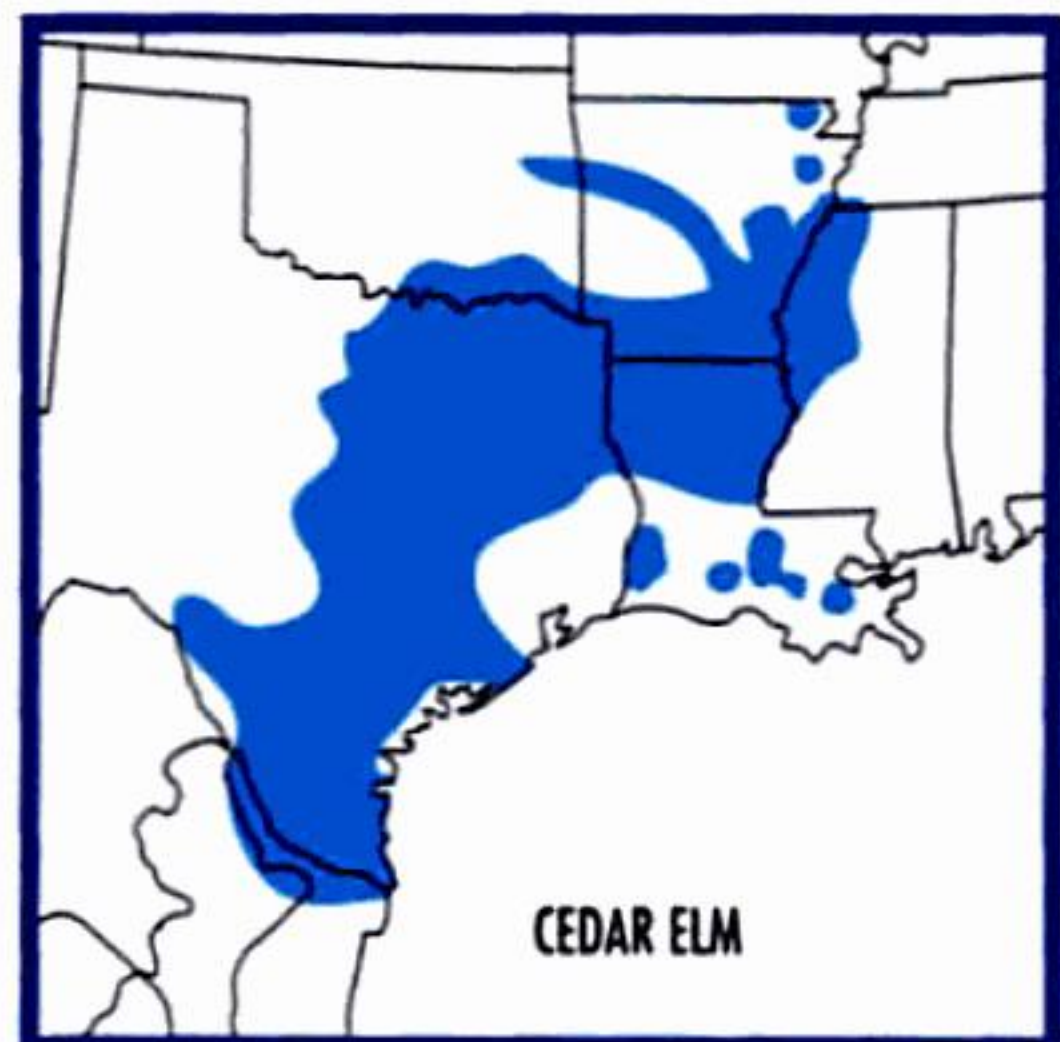
**NOT SHOWN**

An eastern species ranging west to the e. Great Plains and cen. Texas. A medium-sized tree with either single or divided trunk. Leaves 4–8 in. long, *short-stalked*, very *rough* and sandpapery above and hairy beneath. Twigs *rough-hairy*; buds prominently *red-hairy* and more than  $\frac{1}{8}$  in. long. Flowers March–May. Fruits  $\frac{1}{2}$  in., nearly circular, hairless except for centers of each side, slightly notched, short-stemmed, and tightly bunched, May–June. Height 40–60 (70) ft.; diameter 1–2 (3) ft. Fertile uplands. **SIMILAR SPECIES:** No other elm has rough-hairy twigs and red-hairy buds. **REMARKS:** The common name of this coarse-textured tree refers to the slimy inner bark, once well known as a scurvy preventive. It was ground into flour or chewed in pieces. Porcupines also may eat this layer. Cottontail rabbits and deer browse the twigs.

**CEDAR ELM** *Ulmus crassifolia* Nutt.

**PL. 41**

A *small-leaved, fall-flowering* tree with *sandpaper-surfaced* foliage found from the lower Miss. Valley to cen. and s. Texas. Leaves 1–2 in. Leafstalks *short*, about  $\frac{1}{8}$  in. or less in length, often nearly lacking. Narrow *corky wings* may occur on the branchlets. Twigs and buds hairless; buds  $\frac{1}{8}$ – $\frac{3}{16}$  in. long; bud scales brown *without* dark borders. Flowers Aug.–Oct. Fruits  $\frac{3}{16}$ – $\frac{1}{2}$  in. long, deeply notched, and white-hairy, Sept.–Oct. Height to 70 ft.; diameter







*Bark of Winged Elm*

1–2 ft. Bottomlands. **SIMILAR SPECIES:** Winged Elm also has small leaves with short leafstalks and may have winged branchlets. Its leaves are smooth-textured, however, and it produces flowers in spring. **REMARKS:** Often associated with Eastern Redcedar or Ashe Juniper (Pl. 10), both of which are locally called cedars.

**WINGED ELM** *Ulmus alata* Michx.

**NOT SHOWN**

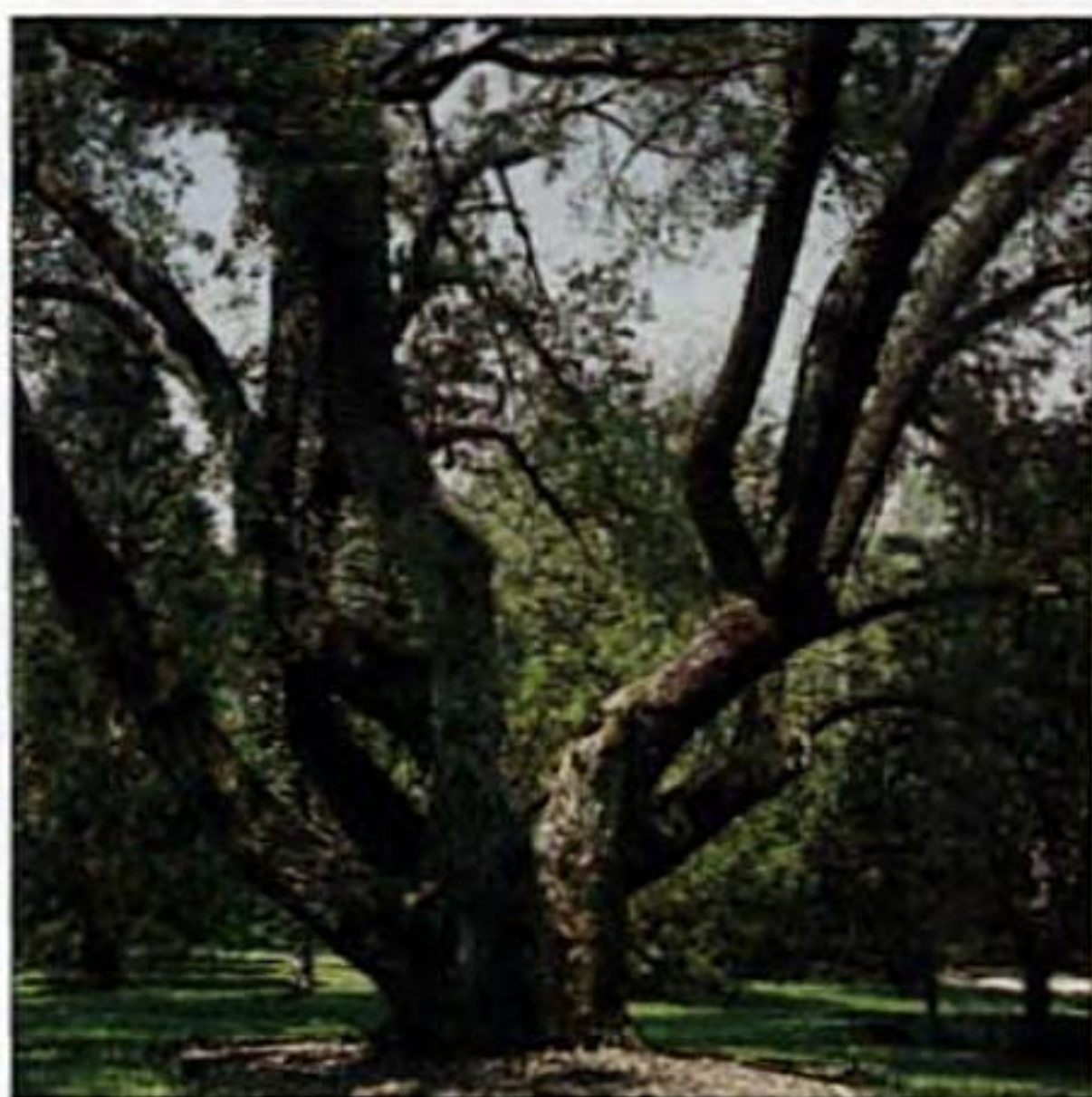
Another eastern species that reaches cen. Texas. Leaves 1–2 in. long, *smooth* above, hairy beneath. Leafstalks *short*. Twigs and buds hairless or nearly so; buds less than  $\frac{3}{16}$  in. long; bud scales with dark borders. At least some of the branchlets are usually with wide, *corky wings*. Flowers March. Fruits are  $\frac{1}{4}$ – $\frac{3}{8}$  in. long, deeply notched, hairy or not, with fringed edges and pointed tips, long-stemmed, March–April. Trunk single or divided. Height 40–50 (60) ft.; diameter 1–2 ft. **SIMILAR SPECIES:** (1) Siberian Elm has single-toothed foliage and small dark buds. (2) See Cedar Elm.

**SIBERIAN ELM** *Ulmus pumila* L.

**PL. 41**

A hardy shrub or small tree introduced from Asia and established from Minn. to N.M. and westward. The 1–3-in. leaves are usually narrow, only slightly uneven-based, and mostly *single-toothed*. Twigs and buds nearly hairless, twigs without wings, leaf buds small, *dark*, and *blunt*. Winter flower buds *nearly black*, enlarged,





evident even from a distance.

Fruits hairless, nearly circular,

$\frac{3}{8}$ – $\frac{5}{8}$  in. long, deeply notched. Height to 80 ft.; diameter 2–4 ft.

Moist sites and hedgerows. **SIMILAR SPECIES:** Other elms have double-toothed leaves and mostly brown buds. **REMARKS:** A windbreak species on the plains. Resistant to Dutch elm disease. Often called Chinese Elm, but this name is better applied to the autumn-flowering, single-toothed, introduced ornamental (*U. parvifolia* Jacq.).

## CHERRIES AND THORNLESS PLUMS (PLATE 42)

Cherries and plums (plus Peach, Pl. 39) are all members of the genus *Prunus* in the rose family. On this plate are thornless species, mostly with fine-toothed leaves. See also thorny plums (Pl. 27), since these are sometimes only slightly thorny. Hollyleaf (Pl. 44) and Catalina (Pl. 45) cherries are both leathery-leaved evergreen species.

The species of this group are mostly alike in having trunks marked with numerous *cross-streaks*, leafstalk or leaf-base *glands* present, buds with more than 3 scales, bundle scars 3, and fruits fleshy with a single seed. Leaves (with 3 exceptions) are single-toothed and mostly long-pointed. The “almond” or sour *odor* of the broken twigs is difficult to describe but once learned (by testing a known plant) is a reliable aid to the identification of many group members, especially cherries. While cherries have true end buds, those of plums are false (use lens). Indian-plum (p. 357) is not a true plum.

Except for Chokecherry and Black Cherry, which have finger-shaped flower/fruit clusters and lack spur branches, the reproductive parts are in umbrella-shaped groups borne on *spur branches*. Remnants of the calyx, the circle of sepals located just



(use lens), short-pointed, with U- or heart-shaped bases, *hairless* midribs, and 8–11 pairs of lateral veins. Leafstalks often reddish. Winter buds hairless, more than  $\frac{3}{16}$  in. long; bud scales *rounded* at tips. Bark gray-brown with shallow fissures. Only this cherry and the next one have spur branches *lacking* and blossoms/fruits in *slender* clusters. Flowers April–July. Fruits purplish, *lacking* persistent calyx remnants, July–Oct. Height 6–20 (30) ft.; diameter 2–6 (8) in. Young woods and thickets. **SIMILAR SPECIES:** See (1) Bitter Cherry and (2) Black Cherry. (3) Sweet, (4) Sour, and (5) Mahaleb cherries have spur branches and fruits in short clusters. **REMARKS:** The tart fruits can be made into delicious jellies and pies. A great number of songbirds as well as ruffed grouse, sharptail grouse, prairie chickens, pheasants, raccoons, black bears, red foxes, deer, bighorn sheep, mountain goats, cottontail rabbits, and several squirrels regularly consume the fruits.

### BLACK CHERRY *Prunus serotina* Ehrh.

PL. 42

Ranging in the West from cen. Ariz. and cen. Texas to Guatemala; also over most of the e. U.S. and se. Canada. A small to large tree whose leaves are 2–6 in. long, *narrow*, and *bluntly* single-toothed (use lens). Distinctive among cherries in having the midrib beneath often (especially in the n. U.S.) *prominently fringed* with brown to whitish hairs. Lateral veins more than 13 pairs. Leaf bases either U- or V-shaped. Buds less than  $\frac{3}{16}$  in. long and hairless; bud scales *pointed*; spur branches *lacking*. Mature trunk with rough dark outer bark whose broken plates are marked with short horizontal lines and often expose red-brown underbark where cracked. Flowers in *slender* clusters, May–June. Fruits blackish, *retaining* calyx lobes. June–Oct. Height 60–80 (100) ft.; diameter 2–3 (5) ft. Woods and thickets. **SIMILAR SPECIES:** Only other tree cherry with regularly narrow leaves is (1) Fire Cherry, but it has mostly hairless leaves and buds clustered near the twig tips as well as spur branches and short flower clusters. Leaves of (2) Chokecherry are wider, hairless, bristly sharp-toothed, and with 8–11 pairs of lateral veins; its buds are somewhat longer, with rounded scale tips. Also, remnants of calyx lobes are not retained on its fruits. **REMARKS:** One of the largest cherries, this species is of value for lumber. Wood hard





and close-grained; used for furniture and interior furnishings. The bitter fruits are often used for jelly. Bark has been used for flavoring. Fruits and twigs eaten by many of the animals listed for Chokecherry.

**FIRE (PIN) CHERRY** *Prunus pensylvanica* L. f. **PL. 42**

Distributed from n. B.C. across Canada to the East Coast and locally southward. A shrub or small tree with *narrow, sharply* single-toothed, hairless leaves 2–5 in. long. Buds short, nearly hairless, with pointed scales and crowded at or *near the ends* of reddish twigs (as well as on spur branches). Bark red-brown, smooth, marked with crossbars. Flowers March–July. Fruits red, calyx deciduous, July–Sept. Height 10–30 (40) ft.; diameter 2–10 (12) in. Thickets and young forests, especially after burns or land clearing. **SIMILAR SPECIES:** (1) Bitter Cherry and (2) Peach (Pl. 39) sometimes have narrow leaves, but they lack crowded end buds and produce different fruits. See (3) Black Cherry. (4) Water Birch (Pl. 41), though with similar bark, has smaller double-toothed leaves and uncrowded end buds with only 2–3 scales. **REMARKS:** Sprouts vigorously following fires. Known also as Bird Cherry. Sour fruits sometimes eaten raw or used in jellies and cough mixtures. Fruits consumed by ruffed and sharptail grouse, ptarmigan, and prairie chickens. Deer, moose, cottontail rabbit, and beaver crop the twigs.

**SWEET CHERRY** *Prunus avium* (L.) L. **PL. 42**

A rather tall tree with a *single* main trunk. Bark *red-brown, smooth*, prominently marked with horizontal stripes, and often peeling. Leaves 2–6 in. long, egg-shaped, rather sharply *double-toothed*, hairless, and with 10–14 pairs of side veins. Buds slender, light brown, more than ¼ in. long. Flowers and fruits clustered on *leafless* spur branches. Flowers April–May. Fruits red to



black, with persistent calyx, sweet. June–July. Height 30–50 (75) ft.; diameter 1–2 (3) ft. Cultivated, sometimes escapes to wild. **SIMILAR SPECIES:** (1) Sour Cherry has leafy spur branches, usually lacks a central trunk, and has only 6–8 pairs of leaf veins. Blunt leaf teeth and rougher bark also are characteristic. (2) Mahaleb Cherry has often-circular aromatic leaves and hairy twigs. (3)





Chokecherry lacks spur branches and has long flower clusters. (4) Fire Cherry has narrow leaves and crowded end buds. **REMARKS:** Imported from Europe, this species is the parent of many of the sweeter garden cherries. A few ornamental varieties possess variegated foliage. Known also as Mazzard Cherry. Fruits attractive to many songbirds and to squirrels.

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**SOUR CHERRY** *Prunus cerasus* L.

**PL. 42**

A tree usually *without* a central trunk. Bark *grayish*, at least on older trunks *much cracked* and broken, sometimes scaly. Leaves 2–5 in. long, like Sweet Cherry but with rounded teeth and 6–8 pairs of veins. Buds stout, dark brown, and more than  $\frac{1}{4}$  in. long. Flowers and fruits clustered on *leafy* spur branches. Flowers May–June. Fruits red, sour, calyx remnants persistent, July–Aug. Height 20–30 ft.; diameter 10–12 in. May escape from cultivation. **SIMILAR SPECIES:** See Sweet Cherry. **REMARKS:** Believed to have originated in w. Asia. Many cultivated varieties, principally those with tart flavor, are derived from this stock. Preferred for making pies.

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**MAHALEB CHERRY** *Prunus mahaleb* L.

**PL. 42**

Similar to Sour Cherry but with *hairy* twigs and small but wide, often *almost circular*, *hairless*, single-toothed leaves that are *aromatic* when crushed. Leaves 1–3 in. long, may be heart-shaped at base, mostly rounded, and glandular. Flowers white, in short clusters. Fruits with calyx deciduous. Established locally in the Pacific Northwest and in ne. U.S./se. Canada. **SIMILAR SPECIES:** See (1) Sweet Cherry and (2) Garden Plum. **REMARKS:** *Mahaleb* is an Arabic name. Originally imported from the Caucasus and Europe for grafting stock. Fruits inedible but yield a violet dye. Oil from seeds used to fix perfumes. Aromatic wood once fashioned into pipes and walking sticks. Also called Perfumed Cherry.

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**GARDEN PLUM** *Prunus domestica* L.

**PL. 42**

A small cultivated tree that has escaped to the wild in some localities in the Northwest and in ne. U.S./se. Canada. Leaves 2–4 in. long, 1–1  $\frac{1}{2}$  in. wide, somewhat hairy beneath, short-pointed, with leaf teeth single and *rounded*. Twigs *hairless*. Flowers spring. Fruits purple, to 1  $\frac{1}{2}$  in. diameter, calyx deciduous. Height to 25 ft. **SIMILAR SPECIES:** Mahaleb Cherry has velvety twigs and aromatic foliage. **REMARKS:** Fruits marketed fresh and as prunes. Originally native in w. Asia and e. Europe. Sometimes called Damson Plum, a name derived from its original range near Damascus, Syria. A thorny variety is sometimes called Bullace Plum.





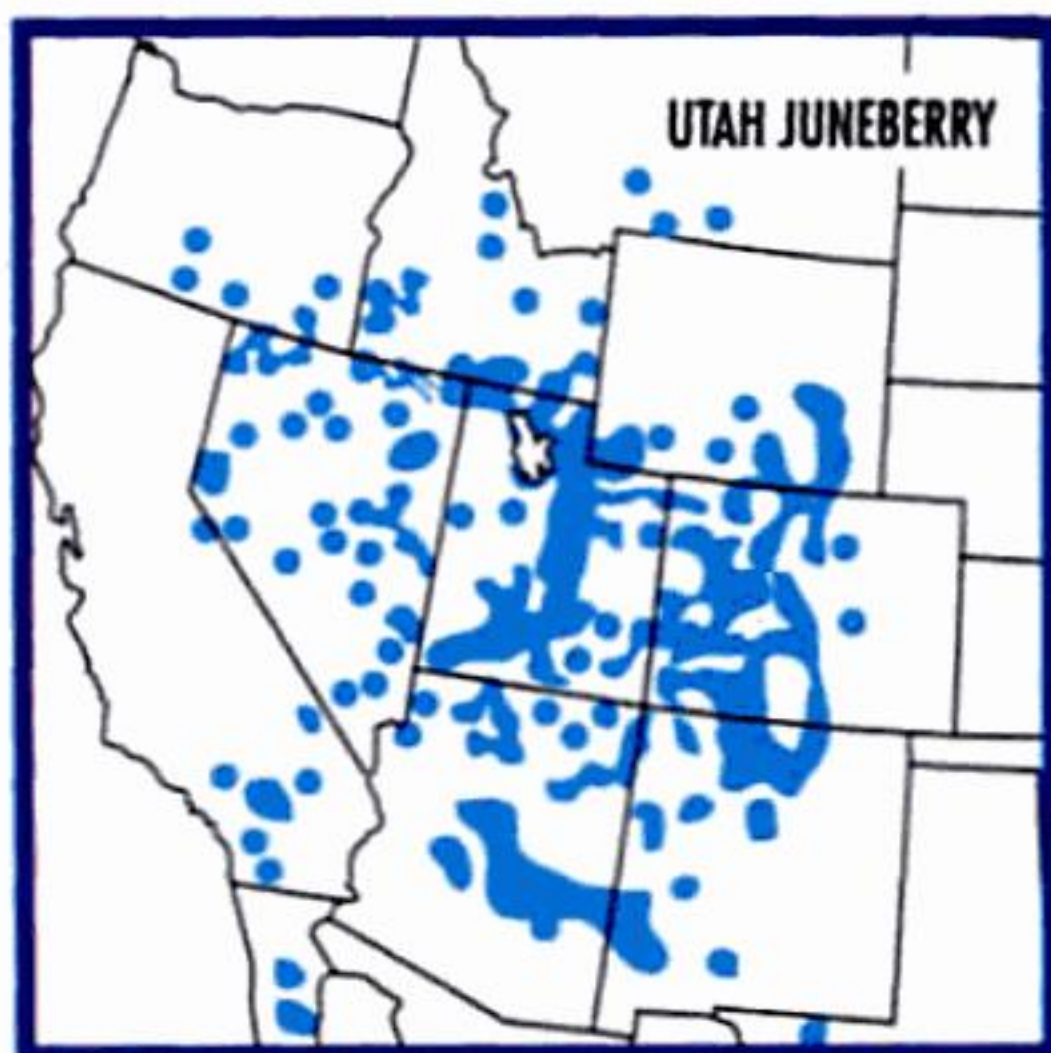
*Amelanchier alnifolia* (Nutt.) Nutt.

A mainly northern shrub or small tree with leaf blades blunt-tipped, nearly *circular*, and *coarse-toothed* mainly above the middle. Leaves mostly hairless, 1–3 in. long with stalks  $\frac{1}{2}$ –1 in. long and 3–20 pairs of teeth. Leaf veins 7–9 pairs, rather parallel but yet somewhat curved and branched. Twigs hairless; buds purplish; spur branches present. Flowers in attractive white clusters, petals  $\frac{3}{8}$ – $\frac{5}{8}$  in. long, April–June. Fruits fleshy, reddish purple,  $\frac{1}{4}$ – $\frac{1}{2}$  in. in diameter, mostly juicy, June–Aug. Height to 22 ft. Thickets and open woods. **SIMILAR SPECIES:** Both this species and Utah Juneberry are variable. In general, however, (1) Utah Juneberry has a more southern distribution and smaller leaves, leafstalks, petals, and fruits. (2) The buckthorns have leaves more strictly parallel-veined and with fine-toothed or wavy edges. **REMARKS:** The alternate name Saskatoon Juneberry refers to Saskatoon, Sask., and reflects the important distribution of the tree in w. Canada. Also known as Alderleaf Juneberry. Plants of this genus are also called serviceberries, but the reason for that name is not clear (unless, with a European *Sorbus* [Pl. 22] being called Servicetree, it is derived from Sorbusberry). Blacktail, whitetail, and mule

Western (Saskatoon) Juneberry







deer all browse the twigs. Sooty grouse, mountain quail, chipmunks, and other wildlife consume the fruits. People also eat them fresh, cooked, or dried.

**UTAH JUNE BERRY** *Amelanchier utahensis* Koehne **PL. 43**

Similar to the last species but more southern and with leaves only  $\frac{1}{2}$ – $1\frac{1}{4}$  in. long including  $\frac{1}{4}$ – $\frac{1}{2}$ -in. stalks. Flower petals mostly under  $\frac{3}{8}$  in. long. Fruits only  $\frac{1}{8}$ – $\frac{1}{4}$  in. in diameter. Mountain slopes and canyons in scattered localities.

**ALDERLEAF CERCOCARPUS**

**NOT SHOWN**

*Cercocarpus montanus* Raf.

Mostly shrubby, with leaves like Birchleaf Cercocarpus (Pl. 44), showing markedly *straight parallel veins*, *wedge-shaped* bases, and often *coarse teeth toward the tips*. Leaves 1– $1\frac{1}{2}$  in. long, hairless to hairy, with tips mostly *rounded*. Twigs generally hairless; spur branches *numerous* and buds *scaly*. Flowers greenish, single or in groups of 2–15, on the spurs, March–June. Fruits tiny, dry, and with an attractive, thin, *feathery tail* 1–3 in. long, often remaining in winter. Height to 20 ft.; rarely reaches tree size. Dry slopes. Ore. and sw. S.D. to Ariz., Colo., and n. Mexico. **SIMILAR SPECIES:** (1) Birchleaf Cercocarpus and (2) Hairy Cercocarpus (both Pl. 44) have evergreen foliage. The former occurs westward with all leaves hairless and toothed. The later is distributed in the Mexican border region with leaves silky-hairy and sometimes without teeth. (3) Curleaf Cercocarpus (Pl. 46) is evergreen with leaf edges not toothed. (4) Juneberries and (5) buckthorns have rounded leaf bases and fleshy fruits. The buckthorns of this plate also lack bud scales and seldom have typical spur branches. **REMARKS:** An important browse species for deer, bighorn sheep and livestock. See discussion of cercocarpuses, p. 360.





and with sharp leaf teeth. **REMARKS:** The exact origin of the apple is lost in antiquity, but it is believed that the species originated in the w. Himalayas and traveled westward by way of n. Persia, Asia Minor, the Caucasus, and the Mediterranean countries. The apple of the Bible is believed to have been not our northern fruit but the apricot, still common in the Holy Land. The Domestic Apple persisting in old orchards or locally gone wild is an important food of deer, pheasant, mourning dove, gray fox, and many other animals. Botanists have also used *Pyrus* and *Sorbus* for the generic name.

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**DOMESTIC PEAR** *Pyrus communis* L.

**PL. 43**

Similar to Domestic Apple but usually with several strong upright branches, making a *narrow-topped* tree. Twigs and branchlets nearly *hairless*, more often thorny, bearing *elongate fleshy* fruits containing *grit* cells. Leaves 1–3 in. Buds less blunt and leaf scars less raised than in Domestic Apple. Flowers white, early spring. Fruits green, autumn. Height 20–35 (60) ft.; diameter 6–15 in. Hedgerows and abandoned farms.

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**INDIAN-PLUM**

**NOT SHOWN**

*Oemleria cerasiformis* (H. & A.) Landon.

Usually a shrub, occasionally treelike. Leaves 2–5 in. long, with teeth *lacking* or faintly wavy-edged, short-pointed or blunt, base *narrowly* V-shaped, fine-hairy beneath (use lens), often clustered near twig ends. Twigs purplish, hairless; pith finely *chambered*; buds  $\pm$  blunt, green, usually 3-scaled, sometimes stalked; bundle scars 3. Trunk bark sometimes with horizontal markings. Flowers whitish, fragrant, in narrow, pendent clusters, March–April; fruits thinly fleshy, one-seeded, eaten by many birds and mammals. Height 5–15 (22) ft. B.C. to n. Calif. and w. slopes of the Sierra Nevada. Older generic names *Osmaronia* and *Nuttallia* are often seen. Also called Osoberry. See Appendix A for other trees with chambered pith.

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**TREE TOBACCO** *Nicotiana glauca* Graham

**PL. 43**

A native of Argentina now established north to cen. and s. Calif. as well as east through the border states to cen. and s. Texas. Leaves 2–8 in. long, short-pointed, and hairless, with *stalks nearly as long as blades*. Leaf edges *not* toothed. Twigs hairless; bundle scars single or indistinct. Flowers 1–1½ in. long, yellow, tubular, in large groups at twig ends. Fruits ¾–1 in. long, dry, egg-shaped capsules. Height to 25 ft. Canyons and watercourses. Attracts hummingbirds.





red, Sept.–March. Height 10–20 (30) ft.; diameter 2–6 (10) in. Wet sites. **SIMILAR SPECIES:** The leaves of Yaupon Holly (Pl. 44) are smaller and evergreen. **REMARKS:** Fruits attractive in winter and eaten by wildlife including bobwhite quail, opossums, and raccoons.

## TREES WITH ALTERNATE EVERGREEN LEAVES TOOTHED (PLATE 44)

Trees of this group have mostly *thickened* foliage with *coarse* teeth sometimes prickly. Flowers are whitish and mostly small. Cliffrose, an exception, has showy blossoms. Fruits of the first two species are reddish and berrylike; those of the next four are small and dry, with long *feathery plumes*. None of the species of this plate occurs north of sw. Ore. and Utah. Bayberries and Torrey Vauquelinia (Pl. 39) also have toothed evergreen leaves, but their foliage is slender, willowlike. See also ceanothuses (Pl. 30).

**TOYON** *Heteromeles arbutifolia* (Lindl.) M. J. Roem. **PL. 44**

An attractive tree of Calif. coastal areas and islands, the Sierra foothills, and Baja California. Leaves 2–5 in. long, sometimes narrow, mostly *pointed at both ends*, sharply toothed but *not* prickly, hairless, and with stout 1-in. leafstalks. Twigs mostly hairless; spur branches lacking. Stumps produce sprouts. Flowers ¼ in. wide, *white*, in showy end clusters 4–6 in. long, June–July. Fruits ¼–¾ in. in diameter, applelike, *red* (or yellow), mealy, seeds 1–4, remaining through winter. Height to 35 ft. Slopes and canyons to 4000 ft. elevation. **SIMILAR SPECIES:** None. **REMARKS:** Harvested for Christmas decorations and planted as an ornamental. The supposed resemblance of the foliage to that of the madrones (Pl. 45) is said to be the basis for the specific name. Toyon is believed to





be derived from a Native American name. Also called Christmas-berry, California-holly, and Hollyberry. Fruits eaten by California quail, bandtail pigeons, and many songbirds.

## HOLLYLEAF CHERRY

PL. 44

*Prunus ilicifolia* (Nutt. ex Hook & Arn.) D. Dietr.

A prickly-leaved tree distributed along Calif. coastal areas from Napa Co. to Baja California Sur. Leaves  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, round-based, short-pointed or sometimes nearly circular, hairless, shiny, with sharp teeth along wavy edges. Leaf veins *not* markedly parallel. Twigs flexible, hairless. Flowers small, white, in slender 2–4-in. clusters from along the twigs, early spring. Fruits juicy, red or yellow, with a single seed, Oct.–Dec. Sprouts after fires. Height to 25 ft. Dry soils to 5000 ft. elevation. Range includes Santa Catalina and San Clemente islands, s. Calif. **SIMILAR SPECIES:** (1) Hollyleaf Buckthorn (Pl. 27) has side leaf veins parallel and twigs short, stiff, and mostly spine-tipped. (2) Prickly-leaved Calif. oaks (Pl. 33) have clustered end buds. (3) Lemonade Sumac (Pl. 45) may have prickly foliage, but the leaves are somewhat aromatic and the fruits red-hairy. **REMARKS:** Fruits eaten by songbirds, twigs browsed by mule deer. Hybrids with Catalina Cherry (Pl. 45) are known.

## CERCOCARPUSES (MOUNTAIN-MAHOGANIES)

The *Cercocarpus* species are a group of trees or shrubs generally recognizable by more or less leathery leaves with straight and *markedly parallel* veins, bases mostly *wedge-shaped*, mostly hairless above, and edges toothed *above* the middle. Buds small,





round, scaly; bundle scars 3, sometimes obscure. Spur branches *numerous*. Flowers small, tubular, greenish white, on the spurs. Each tiny, dry, narrow, half-inch-long fruit has an attractive *feathery tail*, often several inches long.

The brown wood, the basis for the common name, is so dense that it will sink when freshly cut. Used locally in the production of handsome turned objects. Browsed by blacktail and mule deer. Porcupines feed on the inner bark.

Because the trees are not related to the tropical mahoganies, an effort is being made to encourage the use of cercocarpus as a common name. That name derives from the Greek, meaning "tailed fruit." Alderleaf Cercocarpus (Pl. 43) has mainly deciduous foliage; Curleaf Cercocarpus (Pl. 46) has evergreen leaves not toothed. For differences between cercocarpaceae and buckthorns, see p. 355.

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## BIRCHLEAF CERCOCARPUS

PL. 44

*Cercocarpus betuloides* Nutt.

Ranging from sw. Ore. through Calif. to Baja California Norte and cen. Ariz., this species is distinguished by foliage often *velvet-hairy* beneath. Leaves mostly  $\frac{3}{4}$ –1½ in. long with *flat* edges. All leaves toothed. Blossoms in *clusters* of 2–5, Mar.–May; fruit plumes 1½–4 in. long. Height to 25 ft. Dry slopes, chaparral, to 10,000 ft. elevation. **SIMILAR SPECIES:** (1) Hairy Cercocarpus occurs from Ariz. eastward. It has slightly smaller leaves with pointed teeth or none plus rolled leaf edges and feathery fruit tails only 1–1½ in. long. (2) See Catalina Cercocarpus. **REMARKS:** Regarded by some botanists as only a variety of Alderleaf Cercocarpus (Pl. 43).

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## CATALINA CERCOCARPUS

PL. 44

*Cercocarpus traskiae* Eastw.

Similar to Birchleaf Cercocarpus and often considered merely a local variety of it. Leaves 1½–3 in. long, felty-hairy beneath, and often with a U-shaped base. Fruit tails 1½–4 in. long. Flowers and fruits *single* or only a few in a group. Height to 25 ft. Native to mountain slopes of Salte Verde Canyon, Santa Catalina I., Calif.

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## HAIRY CERCOCARPUS *Cercocarpus breviflorus* Gray

PL. 44

A small tree of the Mexican border area. Leaves  $\frac{3}{4}$ –1½ in. long, some toothed toward the apex, and *some without teeth*. Leaf surfaces *silky-hairy* at least beneath. Leaf edges *rolled under*. Flowers *single*, rarely in twos or threes; fruit plumes *short*, only 1–1½ in. long. To 25 ft. Dry slopes at 5000–10,000 ft. elevations, from Ariz. and w. Texas to n. Mexico. **SIMILAR SPECIES:** See Birchleaf Cercocarpus.





3-toothed at the tip. Its foliage is not sticky, the flowers are single, and the fruits are not feathery-tailed. **REMARKS:** Cliffrose bark was used by Native Americans for clothing, sandals, blankets, and rope. The bitter leaves and twigs were employed to induce vomiting. Deer, nevertheless, browse the foliage. Quininebush is a local name. The plant is common on both rims of the Grand Canyon. J. Cowan was an amateur British botanist of the early 19th century.

**BIG SAGEBRUSH** *Artemisia tridentata* Nutt.

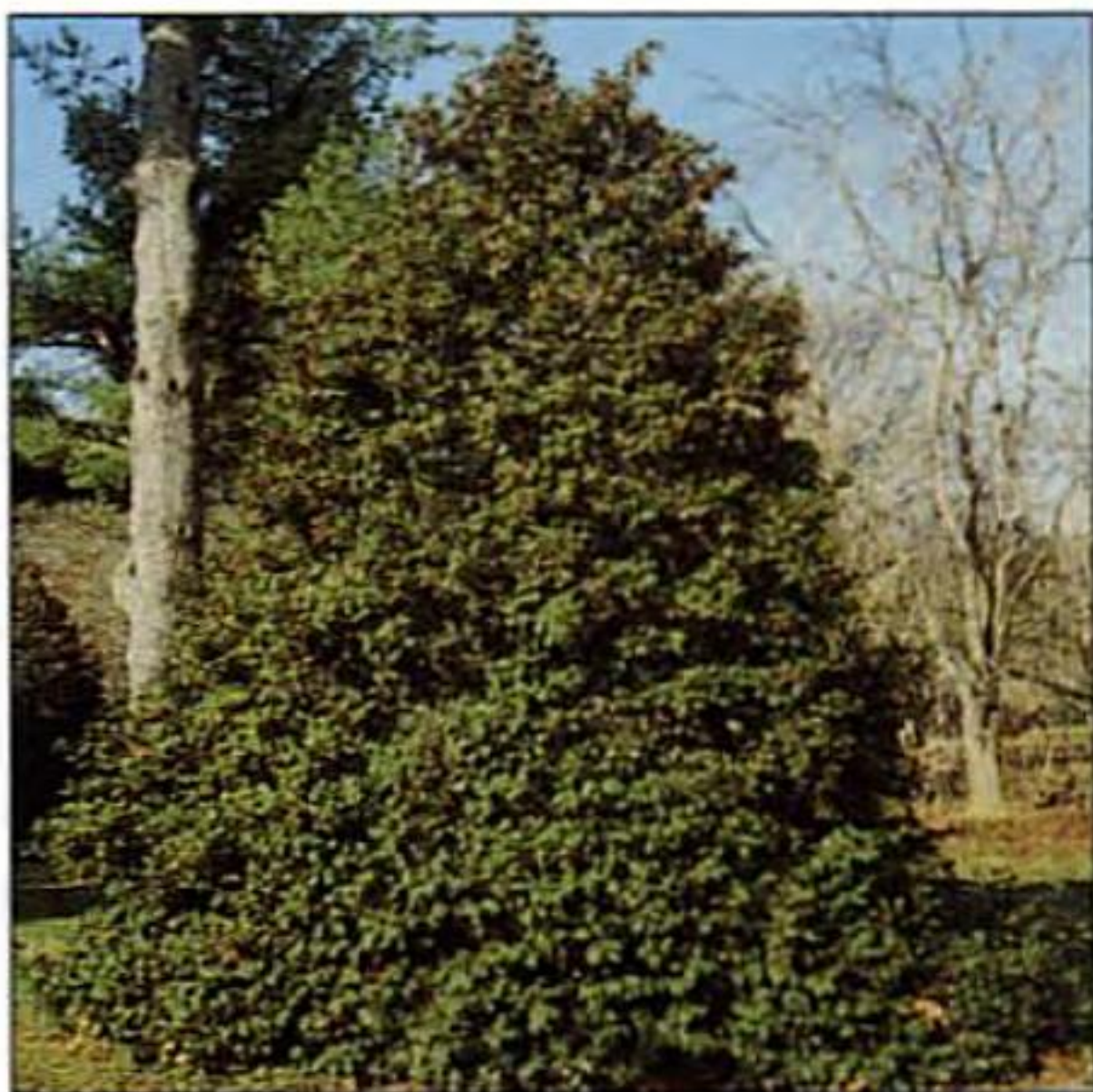
**PL. 44**

Widespread over the semi-arid interior West. Usually shrubby but occasionally attaining tree size. Leaves  $\frac{1}{2}$ –2 in. long, gray-green, hairy, somewhat leathery, *narrowly wedge-shaped*, with short stalks or none, and 3 (5) distinct *teeth at the leaf end*. Leaf scars tiny; bundle scars indistinct. Flowers in small greenish clusters on long upright stems. Fruits tiny, dry, hairy. Height to 15 in. An important browse species for blacktail and mule deer, bighorn sheep, and livestock. Leaves and buds also eaten by dusky, sage, and sharptail grouse. The *sage odor* of crushed leaves is appealing to most people.

**AMERICAN HOLLY** *Ilex opaca* Ait.

**PL. 44**

The Christmas holly of the se. U.S. grows locally west to s.-cen. Texas. It has spread to the wild in the Pacific Northwest and possibly elsewhere. The thick evergreen leaves with *long prickles* are distinctive. They are 2–4 in. long, hairless, *dull-surfaced*, and mostly with U-shaped bases. Some few leaves may be nearly smooth-edged. Twigs hairless; buds minute; spur branches usually present. Flowers greenish, May–June. Fruits fleshy, red, rarely yellow, nutlets 4, Aug.–June. Height 10–40 (100) ft. Bottom-



*American Holly*





lands. **SIMILAR SPECIES:** English Holly (*Ilex aquifolium* L.) is often planted on landscaped areas. Its leaves are smaller ( $\frac{3}{4}$ – $1\frac{1}{2}$  in. long) and shiny. It has spread to the wild in the Pacific Northwest and possibly elsewhere. **REMARKS:** Fruits are eaten by numerous songbirds and by bobwhite quail and wild turkeys. Holly lumber is ivory white and in demand for piano keys, ship models, and inlays.

#### YAUPON HOLLY *Ilex vomitoria* Ait.

PL. 44

Another distinctive plant of the southeastern states whose red-fruited branches are often gathered for decorative purposes. Evergreen leaves *small*,  $\frac{1}{4}$ – $1\frac{1}{2}$  in. long, blunt-tipped, and *wavy-edged*. Flowers May–June. Fruits red, berrylike, nutlets 4, Sept.–Oct. Height 5–15 (30) ft.; diameter 2–4 (12) in. West to s. and cen. Texas. **SIMILAR SPECIES:** Possumhaw Holly (Pl. 43) has wavy-edged leaves that are thin and nonevergreen. **REMARKS:** The caffeine-containing dried leaves reportedly make a desirable tea. As indicated by the scientific name, however, the tea taken in large amounts may act as an emetic. A strong medicinal “black drink” once brewed by Native Americans is believed to have been made from Yaupon leaves. A number of birds, including bobwhite quail, eat the fruits.

### TREES WITH ALTERNATE EVERGREEN LEAVES SOMETIMES TOOTHED (PLATE 45)

Species with evergreen foliage mostly smooth-edged but sometimes, especially on young plants, with the borders toothed or partly toothed. Leaves mostly thick, leathery, either smooth or rough-hairy, mostly with U-shaped bases and usually with stalks over  $\frac{1}{2}$  in. long. Flowers mainly small, white to pink and clustered. Fruits red and (except sumacs) fleshy. Some bayberries (Pl. 39) have leaves of this type, but they are narrow and willowlike. See also Whiteleaf Manzanita, Pl. 40.

#### MADRONES

The madrones, or *madroños*, are mostly distinctively marked by *smooth reddish bark* on the trunk and large limbs. The outer bark







*Bark of Pacific Madrone*



is thin and typically *peels* away or flakes off to show a yellowish or gray layer beneath. The foliage of the 3 species is similar but differs in shape and size. Buds hairless. Flowers are small, white, and urn-shaped with fused petals. The blossoms resemble lilies of the valley and occur in attractive, branched, springtime clusters. Fruits are orange-red, each  $\frac{1}{4}$ – $\frac{1}{2}$  in. in diameter with a fleshy outer layer; often persisting into winter. They are consumed by deer, bandtail pigeons, various quails, and many songbirds. Native Americans once ate them raw or cooked. The bark and leaves have astringent properties. The wood makes good charcoal. Under favorable conditions, specimens reportedly live more than 200 years.

**PACIFIC MADRONE** *Arbutus menziesii* Pursh **PL. 45**

A tree of coastal areas and the cen. Sierra with *wide* leaves 4–6 in. long and  $1\frac{1}{4}$ –3 in. across (sometimes more narrow than illustrated), smooth-edged or fine-toothed. Leaf bases mainly *U-shaped*. Height 25–80 (125) ft.; diameter 2–3 (5) ft. From deep moist soils to dry slopes. B.C. to s. Calif. **SIMILAR SPECIES:** Manzanitas (Pl. 46) have similar trunk bark but are only small trees or shrubs with leaves  $1\frac{1}{2}$ –2 in. long and somewhat round. **REMARKS:** Archibald Menzies, Scottish physician and naturalist, accompanied Capt.





smooth-edged, mostly only 1–2½ in. long and ⅝–¾ in. wide (sometimes to 2 in. x 1 in.), *short-stalked*, more or less *rounded* at both ends, and *not* tending to fold. Rarely with 3 leaflets. Crushed foliage pleasantly resinous. Buds hairy or not, scales lacking. Flowers small, in compact heads with *stout* branches, Oct.–May. Fruits reddish, *sticky*, *hairy*; Aug.–Sept. Height to 15 ft. Dense thickets. **SIMILAR SPECIES:** (1) Laurel Sumac (Pl. 46) and (2) Sugar Sumac have larger, pointed, folding leaves. In sw. Ariz. and Baja California, see also (3) Kearney Sumac (Pl. 46). (4) Evergreen oaks (Pl. 33) have clustered end buds and acorn fruits. (5) See Hollyleaf Cherry (Pl. 44). **REMARKS:** Will grow on extremely poor and saline soils. Lower branches take root. Root system extends 10 ft. or so beyond the above-ground plant. Roadrunners and other birds consume the fruits.

## CALIFORNIA BUCKTHORN

**NOT SHOWN**

*Rhamnus californica* Eschsch.

With its principal range throughout Calif.'s coastal mountains and the Sierra Nevada, this shrub (rarely a small tree) occurs again from cen. and se. Ariz. to sw. N.M. and also locally in s. Nev. and sw. Ore. Leaves *variable*. Foliage ranges from narrow to wide but mostly 2–4 in. long and ½–2 in. wide with 7–11 distinctly *straight and parallel* pairs of veins. Leaves often whitish beneath, sometimes fine-toothed, with bases either U- or V-shaped. Some leaves may be opposite or nearly opposite. Twigs hairless to hairy; buds hairy, *without* scales; pith *white*. Flower clusters greenish, at the leaf angles, March–April. Fruits from green to red then black, fleshy, with several seeds, Aug.–Sept. Height to 15 ft. Canyons and slopes to 4000 ft. elevation in most of Calif.; 4000–7500 ft. elsewhere. **SIMILAR SPECIES:** (1) Cascara and (2) Birchleaf buckthorns (Pl. 43) and the (3) cercocarpuses (Pls. 43, 44) also have

straight and parallel leaf veins. The leaves of those buckthorns are larger and deciduous, however, and more regularly toothed, while the leaves of cercocarpuses mostly are smaller, wedge-based, and toothed only near the tips. See (4) Sugar Sumac. **REMARKS:** Also known as Coffeeberry. Fruits eaten by a number of birds and by black bears. See comments under buckthorns, p. 355







*woolly*. Flowers showy,  $\frac{1}{2}$ –1 in. across, white with yellow centers, in leaf angles and at twig ends, April–June. Fruits are 1 in. long, egg-shaped, reddish brown, single-seeded, July–Sept. Height to 25 ft. **SIMILAR SPECIES:** See Anacua. **REMARKS:** Pronounced ahnahcah-WEE-tah. Also known as Mexican-olive. Fruits are reported to be edible but to cause dizziness. Javelinas (peccaries) and other wildlife eat them readily.

### SPARKLEBERRY *Vaccinium arboreum* Marsh.

PL. 45

A southeastern plant ranging west to se. Texas as a shrub or small crooked tree. The tallest member of the blueberry genus. Leaves elliptic, 1–2 in. long, *short-stalked*, sometimes fine-toothed, hairless, and with a slender tip. Twigs hairy or not. End bud false. Height to 30 ft. Flowers white, bell-shaped, in drooping clusters, April–June. Fruits fleshy, edible but not tasty, black, Sept.–Oct. Also called Farkleberry.

## TREES WITH ALTERNATE EVERGREEN LEAVES NOT TOOTHED (PLATE 46)

Foliage of this type occurs also on the bumelias (Pl. 28), but they are thorny. It may also occur on some oaks (Pls. 33–35), but they have clustered end buds. Such leathery evergreen foliage also may be present on some California Fremontia (Pl. 29) specimens, on some narrow-leaved nonwillows (Pl. 39), and on the sometimes-toothed species of Pl. 45. Most species of this plate have hairless twigs. Texas Persimmon is deciduous in some areas.

### PACIFIC RHODODENDRON

PL. 46

*Rhododendron macrophyllum* D. Don ex G. Don

A handsome shrub or small tree of nw. coastal areas and Cascades south to n. Calif. Leaves 3–6 (10) in. long, 1–2 (2½) in. wide, hairless, pointed at *both* ends, and edges *rolled under*. Flowers 1–2 in. long, showy, pink-purple (rarely white), in dense twig-end clusters, May–June. Fruits slender, dry, brownish capsules splitting into 5 parts. Trunk rough, dark. Height to 25 ft. Thickets. **SIMILAR SPECIES:** (1) Pacific Madrone (Pl. 45) has smooth, sometimes peeling, reddish bark. (2) Bluegum Eucalyptus has mostly







curved, flat, aromatic leaves and stout, somewhat top-shaped fruit capsules. **REMARKS:** Also called California Rosebay. Foliage poisons sheep.

### BLUEGUM EUCALYPTUS *Eucalyptus globulus* Labill. PL. 46

Of the several introduced members of this large and mainly Australian genus, this species reproduces naturally in the warmer parts of Calif. Leaves 5–12 in. long,  $\frac{3}{4}$ –1  $\frac{1}{2}$  in. wide, stiff, *flat*, usually *curved*, *long-pointed*, and *aromatic* when crushed. Foliage with U-shaped bases, dull green on both sides, and tending to *hang vertically*. Young leaves may be shorter and opposite on some twigs. Flowers white, single, at leaf angles, Dec.–May. Fruits dry, heavy, 1-in. circular or angular capsules. Trunk bark *peels* in strips; underbark gray to yellowish. Height 70–140 ft. Spreads from windbreaks and other plantings. **SIMILAR SPECIES:** See Pacific Rhododendron. **REMARKS:** Quick-growing, but wood is brittle and of little value. Falling outer bark and fruits are a nuisance in landscaped areas.



*Bluegum Eucalyptus*



## BIGBERRY MANZANITA

*Arctostaphylos glauca* Lindl.

NOT SHOWN

Occurring below 4500 ft. elevation in the coastal ranges and interior slopes of cen. and s. Calif. Leaves *whitened* and leafstalks  $\frac{1}{4}$ – $\frac{1}{2}$  in. long. Twigs *hairless*. Fruits sticky,  $\frac{1}{2}$ – $\frac{3}{8}$  in. in diameter, and with *little pulp*. From San Francisco Bay south to cen. Baja California. Browsed by deer.

## PRINGLE MANZANITA

*Arctostaphylos pringlei* Parry

NOT SHOWN

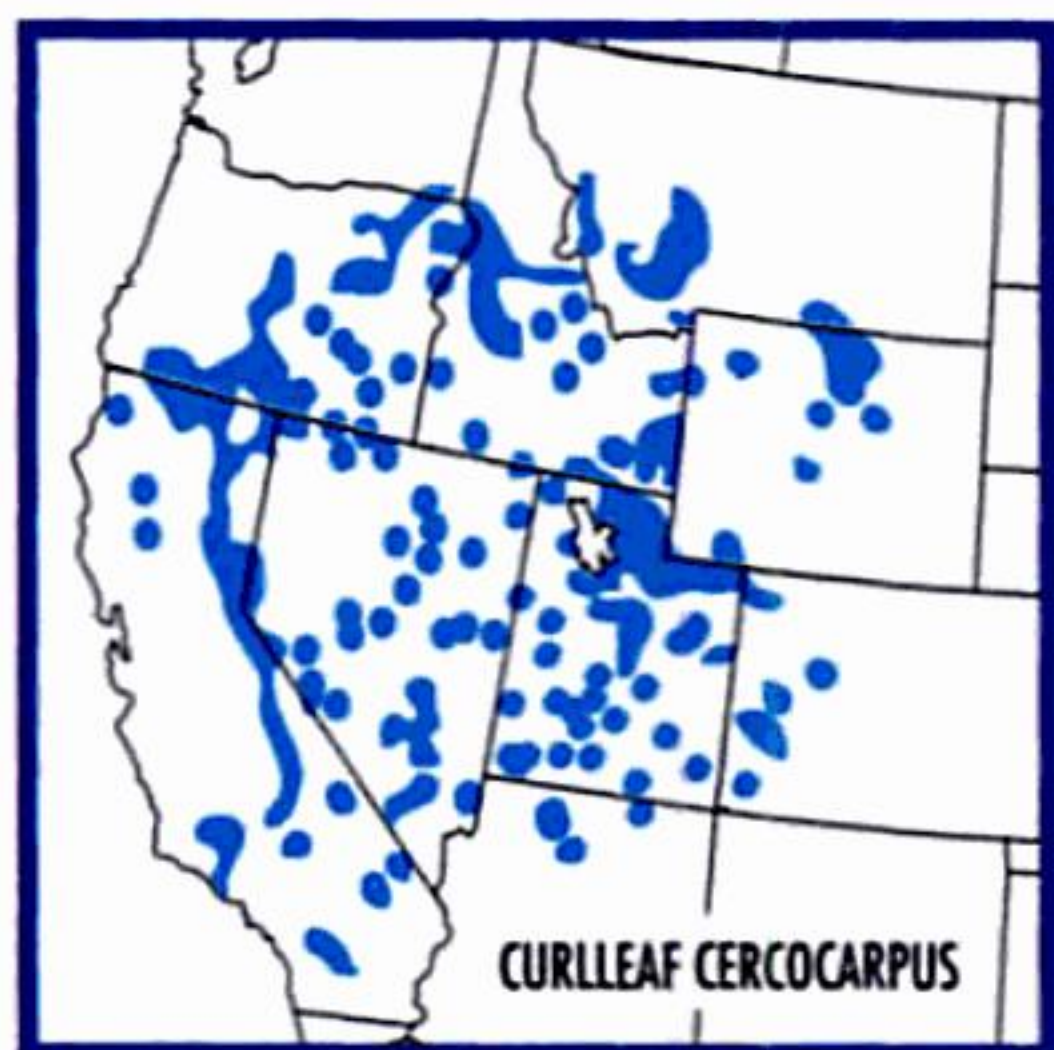
Similar to the last species but with foliage more *gray-green*, leafstalks  $\frac{1}{8}$ – $\frac{1}{4}$  in. long, and twigs *sticky-hairy*. Fruits glandular-hairy,  $\frac{1}{4}$ – $\frac{3}{8}$  in. in diameter. Local in mountains of s. Calif., cen. Ariz., and Baja California Norte at 4000–7000 ft. elevations. Fruits are a source of food for foxes, coyotes, and skunks as well as for Gambel and Mearns quail.

## CURLLEAF CERCOCARPUS

PL. 46

*Cercocarpus ledifolius* Nutt.

This widespread cercocarpus occurs as a shrub or small tree on mountain slopes throughout much of the American West. The *small, curled-under* foliage is distinctive. Leaves  $\frac{1}{2}$ – $1\frac{1}{2}$  in. long,  $\frac{3}{8}$ – $\frac{5}{8}$  in. wide, pointed at both ends, hairy beneath, clustered on spur branches, and with leafstalks  $\frac{1}{8}$ – $\frac{3}{16}$  in. long. Flowers inconspicuous, without petals, at leaf angles, July–Aug. Fruits attractive, with *feathery tails*, 2–3 $\frac{1}{4}$  in. long, Aug.–Sept. Heartwood dark brown. Height to 40 ft. Dry soils, 5000–9000 ft. elevation. **SIMILAR SPECIES:** Other evergreen cercocarpaceae and the related Cliffrose (Pl. 44), all with feathery-tailed fruits, have toothed leaves. **REMARKS:** Wood so heavy that it will not float; an excellent fuel.





Browsed heavily by mule deer. Also called Curleaf Mountain-mahogany (see discussion of cercocarpuses, p. 360).

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**LAUREL SUMAC** *Rhus laurina* Nutt.

**PL. 46**

A shrub or small tree found from the mainland and islands of sw. Calif. to Baja California Sur. Leaves 2–5 in. long, 1–2 in. wide, with U-shaped bases, *short- to long-pointed tips*, and *tending to fold* along the midrib. Foliage with a mild and perhaps somewhat unpleasant odor when crushed. Leafstalks  $\frac{1}{2}$ –1 in. long. Buds small, hairless, *without* scales. Flowers small, white, in dense and finely branched end clusters, June–July. Fruits *smooth, white*,  $\frac{1}{8}$ – $\frac{1}{4}$  in. in diameter, persisting from Sept. into winter. Height to 15 ft. Dry slopes to 3300 ft. elevation in coastal areas, including Santa Catalina and San Clemente islands in Calif. and Cedros and Guadeloupe islands off Baja California, Mexico. **SIMILAR SPECIES:** (1) Kearney Sumac has leaves mostly blunt-tipped and fruits red-hairy. See (2) Sugar Sumac (Pl. 45). **REMARKS:** Like Sugar Sumac, this species recovers rapidly after fires and is useful in erosion control. Both common and scientific names refer to the Old World laurels, which also have leathery foliage. Fruit heads are a food source for deer and quail.

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**KEARNEY SUMAC** *Rhus kearneyi* Barkley

**PL. 46**

A rare species of extreme sw. Ariz. and Baja California with leaves  $1\frac{1}{2}$ – $2\frac{1}{4}$  in. long,  $\frac{3}{4}$ –1 in. wide, and mostly *rounded* at both ends. Leafstalks under  $\frac{3}{8}$  in. long and leaf margins usually *rolled under*. Buds small, hairy, without scales. Flowers white, fruits *red-hairy*. Height to 20 ft. In the U.S., recorded only from near Tinojas Altas, Yuma Co., at 1000–1500 ft. elevation. **SIMILAR SPECIES:** See (1) Lemonade Sumac (Pl. 45) and (2) Laurel Sumac.

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**TEXAS PERSIMMON** *Diospyros texana* Scheele

**PL. 46**

Confined to the s. half of Texas and adjacent ne. Mexico. It is deciduous on the Edwards Plateau and perhaps in other areas of the more northern parts of the range. A shrub or small tree with leaves 1–2 in. long,  $\frac{1}{4}$ – $\frac{1}{2}$  in. wide, *blunt-tipped*, V-shaped at the base, shiny, with edges rolled under and leafstalks short or *lacking*. Foliage hairless above but somewhat hairy beneath, at least on the midrib. Twigs smooth gray, sometimes spiky; winter buds small, black with some gray outer scales; bundle scar 1. Flowers  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, white, April–May. Fruits black,  $\frac{3}{4}$  in. in diameter, fleshy, July–Aug. Smooth gray trunk bark peels to show yellow and green underbark in a *mottled* pattern; sometimes dark gray over silver-gray over yellow-white. Heartwood dark. Height to 50







## PALMS, CACTI, AND YUCCAS

### PLATE 47

The palms, cacti, and yuccas are clearly different from other woody plants. The first and last groups have parallel-veined leaves clustered at the ends of the stems. In the palms, these are long-stalked. The tree-size cacti have unique succulent and spiny stems like those of no other trees. All are evergreen.

Palms from all over the world have been imported and planted in the subtropical portions of the Southwest. The species native to the U.S. are emphasized here. Most have single unbranched trunks with the leafy fronds of two types. They are either fan-shaped, with segments radiating from the end of a central leaf-stalk (or a quite short "partial midrib"), or they are long and feathery with a central midrib.

Yuccas have abundant, long, sword-shaped, and usually spine-pointed leaves whose bases clasp the stem. The many western yucca species can be separated according to the identification chart on p. 384.

### PALMS AND TREE-CACTI (PLATE 47)

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These are evergreen plants of sw. arid regions with either parallel-veined leaves or succulent thorny joints. California Washingtonia, in s. Calif. and sw. Ariz., plus two *Sabal* species in Texas are fan-leaved and the only native palms in the Southwest. In addition, the Date Palm is listed here as an example of the feather-leaved palms and of the many foreign palms planted in the warmer parts of the region. Palm flowers are white and fragrant. As for cacti, only a few species grow to tree size. Their leaves are lacking or not readily identifiable as such.







*California Washingtonia*



## CALIFORNIA WASHINGTONIA

PL. 47

*Washingtonia filifera* (Linden ex Andre) H. Wendl.

A tall palm crowned by a cluster of *gray-green fan-shaped* leaves. Each leaf frond 3–6 ft. in diameter, divided into numerous narrow folds, and often deeply torn. Leaf edges display numerous *fibrous threads*. Leafstalks 3–6 ft. long extending well into the leaf blade, with hooked *spiny teeth* along the edges. Trunk partially or completely covered by hanging dead leaf fronds. Flowers small, in branched clusters, enclosed in a narrow, yellowish, membranous spathe 1–2 ft. long, June. Fruits spherical, fleshy, black at maturity,  $\frac{1}{4}$ – $\frac{1}{2}$  in. diameter. Height to 50 (75) ft.; diameter 2 (3) ft. Desert springs, Colo. and s. Mohave deserts, Calif., Kofa Mts., Ariz., and south in Mexico. Planted from s. Calif. to s. Texas. **SIMILAR SPECIES:** See Mexican Washingtonia. **REMARKS:** Also known as Washington Fan Palm. Named in honor of George Washington. Dead leaves often removed from planted specimens to reduce dangers of fire and rodent infestation. Leaves used for thatched roofs in some areas. An indicator of underground water. Native Americans ground the seeds into flour. They also ate the growing tip or palm heart which, like that of all palms, makes a fine salad.







Destruction of this terminal bud, however, kills the tree. California Washingtonias are easily seen at Palm Springs, Calif., and in a natural setting at nearby Palm Canyon. Twentynine Palms, Calif., also is home to this tree.

## MEXICAN WASHINGTONIA

NOT SHOWN

*Washingtonia robusta* Wendl.

Similar to the last species but with foliage *light green*. Trunk more slender and *flaring* abruptly at the base. Leafstalks 2–3 ft. long. Native to Baja California and planted from s. Calif. to s. Texas.

## MEXICAN PALMETTO *Sabal mexicana* Mart.

PL. 47

A native palm growing wild only in the lower Rio Grande Valley of Cameron Co., Texas, and south to Central America. Strong trees whose *fan-shaped* leaves are 3–7 ft. or more in diameter and with an equally long *thornless* stalk. The leafstalk penetrates the leaf blade 4 in. or more. Flowers in clusters up to 8 ft. long. Fruits  $\frac{3}{4}$ –1 in. in diameter, dry, black, somewhat edible. Height to 50 ft.; diameter to 2½ ft. See next species.

## DWARF PALMETTO *Sabal minor* (Jacq.) Pers.

NOT SHOWN

An eastern U.S. shrub or tree whose range extends westward to cen. Texas. Similar to Mexican Palmetto, but leafstalk penetrates the leaf blade only 2 in. or less. Also fruits *under* ¼ in. in diameter. To 20 ft. tall, the most treelike specimens reportedly occur in Brazoria Co., south of Houston, Texas.

## DATE PALM *Phoenix dactylifera* L.

PL. 47

An example of *feather-leaved* palms. Cultivated commercially mainly along the Mexican border for the tasty and nutritious fruits. Leaves *gray-green*, 15–20 ft. long, and somewhat erect.





Leafstalks extend the full length of the fronds; leaflets nearest trunk spinelike. Height to 35 ft. Reported sometimes to spread from plantings. The related Canary Islands Date Palm (*P. canariensis* Chaub.), with *light green* foliage and leaves more drooping, is widely planted as far north as n. Calif.

## SAGUARO *Cereus giganteus* Engelm.

PL. 47

A unique and widely recognized symbol of the southwestern desert. The *single*, tall, stout, thorny, green trunk is ribbed vertically and branched in maturity. Flowers white, waxy, about 2 in. in diameter, remaining open only about 24 hours, April–May. Fruits fleshy, reddish berries 2–3 in. long, with black seeds, June–July. To 50 ft. tall. Rocky soils of w.-cen. Ariz., barely into se. Calif. and south through Sonora, Mexico. **REMARKS:** Pronounced sah-WAHR-oh. Also called Giant Cactus. Sometimes placed in the genus *Carnegiea*. The corrugated trunk becomes more smooth when water is absorbed during rainy periods. The edible fruits have been gathered for centuries by Native Americans to be eaten fresh or made into preserves. The fermented fruit juice also has been made into an alcoholic drink. Fine stands of this tree can be seen at Saguaro National Park near Tucson, Ariz.

*Saguaro*







*Jumping Cholla*



## JUMPING CHOLLA *Opuntia fulgida* Engelm.

PL. 47

Though related to the flat-pad pricklypears, this cactus has more or less *cylindrical joints*. These are covered by countless inch-long *needle-sharp* and *barbed* thorns. Flowers pink, about 1 in. across, summer. Fruits 1–2 in. long, somewhat pear-shaped, green, smooth, spineless, and producing new fruits at their tips. If undisturbed, clusters of fruit chains form over months or years. Height to 15 ft. Cen. Ariz. to nw. Mexico. **REMARKS:** Pronounced CHOY-yah. Approach these plants with caution! As one author puts it: “The Cholla doesn’t jump. *You* do!” Even brushing against one causes the barbed spines to penetrate the skin in large numbers. Removing the harpoon-type barbs is painful. Cholla reproduction is mainly by vegetative means; joints break off easily and take root. Thickets of shrubby chollas are impenetrable by people but are homes to rodents and nesting birds. Fruits are eaten by rodents, deer, and javelinas. A variety is known as Chainfruit Cholla. Many related shrubby species.

## YUCCAS (CHART, P. 384)

A distinctive group of plants with dense clusters of evergreen, parallel-veined, *bayonet-shaped*, and *sharply spine-tipped* leaves.





# YUCCAS

Southwestern arid-zone plants with evergreen, parallel-veined, bayonet-shaped, spine-tipped leaves and upright clusters of showy white blossoms. The three sepals and three petals of the flowers are all alike. Most species with cylindrical, fleshy fruits 3–5 in. long, soon drooping, not splitting. Other yucca species are shrubby. Bigelow *Nolina* is similar but shrubby with leaves grasslike.

## SPECIES AND REMARKS

	Major distribution <sup>1</sup>	Leaves over 2 ft. long	Leaf width <sup>2</sup>	Leaf edges <sup>3</sup>	Leaf top flat or concave <sup>4</sup>	Leaf shade of green <sup>5</sup>	Flower stalk length (ft.)	Single blossom over 2 in. long	Text page
<b>JOSHUATREE YUCCA</b> <i>Yucca brevifolia</i> Trunk ± bare, leaves 5–13 in.; Mohave desert	PS	–	N	T	F	B	½–1	+	383
<b>MOHAVE YUCCA</b> <i>Y. schidigera</i> Leaves 1½–3 ft. long; s. Calif. to s. Nev./nw. Ariz.	PS	±	M	F	C	Y	1–2	–	386
<b>SCHOTT YUCCA</b> <i>Y. schottii</i> Flower stalks woolly; se. Ariz./ sw. N.M.	S	±	M	N	C	B	1–3	–	386
<b>SOAPTREE YUCCA</b> <i>Y. elata</i> <sup>6</sup> Leaves thin, flexible; cen. Ariz./ sw. Utah to n. Mexico	S	±	N	F	F	Y	3–7	–	387
<b>TORREY YUCCA</b> <i>Y. torreyi</i> Flower parts united at base only, leaves ± rough; to s. N.M.	WT	+	W	F	C	Y	3–4	+	387
<b>FAXON YUCCA</b> <i>Y. faxoniana</i> Flower parts united basal ½ in.	WT	+	W	F	C	D	3–4	+	388
<b>CARNEROS YUCCA</b> <i>Y. carnerosana</i> Flower parts united basal 1 in.	WT	+	W	F	C	Y	5–7	+	388
<b>BEAKED YUCCA</b> <i>Y. rostrata</i> <sup>6</sup> Only Brewster Co., w. Texas	WT	–	N	T	F	Y	1–4	+	388
<b>TRECU YUCCA</b> <i>Y. treculeana</i> S.-cen. Texas	T	±	W	N	C	B	2–5	–	388

<sup>1</sup> P = Pacific states (s. Calif.), S = Southwest, T = Texas, wT = w. Texas

<sup>2</sup> M = medium, 1–2 in.; N = narrow, ½ in. or less; W = wide, over 2 in.

<sup>3</sup> F = fibrous threads frequent, T = fine-toothed, N = neither toothed nor fibrous

<sup>4</sup> C = concave or grooved, F = flat

<sup>5</sup> B = blue-, D = dark-, Y = yellow-green

<sup>6</sup> Fruits dry, erect, thin-walled, splitting





## SOAP TREE YUCCA *Yucca elata* Engelm.

CHART P. 384

Occurring from Ariz. eastward, this is a very *narrow-leaved* yucca with a *long-stalked* flower cluster and *dry* fruits that split open when ripe. Leaves 12–35 in. long,  $\frac{1}{8}$ – $\frac{5}{16}$  in. wide, flat above, yellow-green, very thin ( $\frac{1}{32}$  in.) and *flexible*, the edges with fine *separating fibers*. Flowers and stalks combined are 3–7 ft. in length; single blossoms to 2 in. long; May–July. Fruits  $1\frac{1}{2}$ –3 in. long, thin-walled, dry, *erect*, and *splitting open*. Height to 30 ft., usually branched. Grasslands and deserts at 1500–6000 ft. elevation. **SIMILAR SPECIES:** In w. Texas, (1) Beaked Yucca has leaves stiff and fine-toothed, without edge fibers. (2) Carneros Yucca differs in having nonsplitting fruits as well as leaves 2–3 in. wide and fruits fleshy. Westward, see (3) Schott Yucca. **REMARKS:** Native Americans used the leaves for baskets and fluids of the roots and stems for soap. During droughts, the chopped foliage sometimes is fed to livestock.

## TORREY YUCCA *Yucca torreyi* Shafer

CHART P. 384

This yucca occurs from s. N.M. and w. Texas into n. Mexico. Leaves 2–5 ft. long, 2–3 in. wide, thick, dull,  $\pm$  *roughened* on both surfaces, *concave* above, *gray-green*, with *loose fibers* at the edge. Flower clusters *elongate* to 3–3½ ft. long; single blossoms 2–3 in. in length, March–April. Flower segments fused only at the base. Fruits 4–6 in. long, fleshy, and nonsplitting. Height to 25 ft., often not branched. Dry soils east to Devil's R., Texas. **SIMILAR SPECIES:** In w. Texas, Faxon and Carneros yuccas also have long, wide, fiber-edged leaves. (1) Faxon Yucca has dark green leaves and flower segments fused into a half-inch-long tube. (2) Carneros Yucca has yellow-green leaves and ball-shaped flower clusters on lengthy stalks. Both of these yuccas have smooth-surfaced foliage. **REMARKS:** Once described as a variety of the large-fruited but shrubby Ba-



*Torrey Yucca*



nana Yucca (*Yucca baccata* [Engelm.] Trel.). It is now recognized as a full species, but hybrids between these forms have been identified. Locally called Palmapita (PAL-mah-PEET-ah).

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**FAXON YUCCA** *Yucca faxoniana* Sarg.

**CHART P. 384**

A tree found only in far w. Texas and locally in adjacent Coahuila, Mexico. In this species and the next, the petals and sepals are united at the base to *form a tube* that, in this species, is  $\frac{1}{2}$  in. long. Leaves much as in the last species but *dark green* and *smooth-surfaced*. Flower clusters elongate, 3–4 ft. long. Height to 15 ft. Desert scrub. Hybridizes with Torrey Yucca. **REMARKS:** Charles E. Faxon was a botanical artist who illustrated Charles Sprague Sargent's 14-volume *Silva of North America*, published between 1891 and 1902. He made the first drawing of this species.

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**CARNEROS YUCCA**

**CHART P. 384**

*Yucca carnerosana* (Trel.) McKelvey

A tree of Brewster and Culberson counties, w. Texas, and adjacent Mexico. Leaves smoothly *yellow-green*; otherwise as in the two preceding species. Flower parts united to the extent of 1 in.; blossom cluster 5–7 ft. tall and *almost round*, about as wide as tall. Height to 20 ft. and mainly unbranched. Rocky slopes. **REMARKS:** First found at Carneros Pass, Coahuila, Mexico.

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**BEAKED YUCCA**

**CHART P. 384**

*Yucca rostrata* Engelm. ex Trel.

A rare tree in the U.S., recorded only from Brewster Co. in the Big Bend country of w. Texas and in the nearby states of Coahuila and Chihuahua, Mexico. Leaves short and narrow, being only 15–24 in. long and  $\frac{3}{8}$ – $\frac{1}{2}$  in. wide. Foliage is yellow-green, flat above, often keeled beneath, stiff, and mostly edged with *extremely fine teeth*. Flower stalks 1–4 ft. tall; single blossoms 2–2½ in. long, the parts *not* united. Related to Soaptree Yucca and, like it, with erect fruits becoming dry, durable, and *splitting open*. In this yucca, fruits often *very* numerous (about 100), 2–3 in. long, and with *slender beaks* 1–1½ in. long. Height to 15 ft. Slopes and canyons.

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**TRECU YUCCA** *Yucca treculeana* Carr.

**CHART P. 384**

Distributed mainly eastward of the last several species, Trecul Yucca also differs in that the smooth leaves are 20–50 in. long and blue-green. Leaf edges *neither* toothed nor fibrous. Flower stalks 2–5 ft. tall; individual blossoms only 1–2 in. long. Fruits only 2–4 in. long. Dry plains and slopes of s.-cen. Texas and nearby Mexico. Also called Palmapita. Hybrids with Torrey Yucca have been recorded.





12. Twigs slender, pith narrow. **SIERRA BLADDERNUT PL. 11**  
 12. Twigs stout but weak, pith wide. **ELDERBERRIES PL. 14**
13. Bundle scars more than 1. 14  
 13. Bundle scar 1. 17  
 14. Bundle scars 3. 15  
 14. Bundle scars many. 16
15. End bud small, scaly or white-hairy. **MAPLES PLS. 14, 15**  
 15. End bud very large, scaly. **BUCKEYES PL. 11**  
 16. Buds scaly, bundle scars often in 3 groups. **BUCKEYES PL. 11**  
 16. Buds smooth-granular. **ASHES PLS. 12, 13, 16**
17. Leaf scars often whorled; fruits dry, brown, 1-in. balls, damp sites from e. U.S. to w. Texas. **BUTTONBUSH PL. 17**  
 17. Leaf scars both opposite and alternate but not whorled, fruits various. 18  
 18. Trunk greenish, mottled, fruits ¼-in. dry capsules. **CRAPEMYRTLE PL. 17**  
 18. Trunk brown, ridged; fruits 4–10-in., cigar-shaped, dry capsules. **DESERT-WILLOW PL. 39**
- B. LEAF SCARS ALTERNATE:**  
 19. Twigs quite silvery, branchlets sometimes thorny. **RUSSIAN-OLIVE PL. 39**  
 19. Twigs not silvery, branchlets variable. 20  
 20. Trees thorny. 21  
 20. Trees not thorny. 37
- D. TREES THORNY:**  
 21. Green grasslike streamers (leaf midribs) 10–15 in. long present; twigs green, drooping. **JERUSALEM-THORN PL. 19**  
 21. No green grasslike streamers present. 22  
 22. Only paired thorns present. 23  
 22. Single thorns present, alone or with paired thorns. 25
- E. ONLY PAIRED THORNS PRESENT:**  
 23. Buds hidden beneath leaf scars, bundle scars 3, spur branches lacking. **LOCUSTS PL. 18**  
 23. Buds not hidden, bundle scar 1, spur branches common. 24  
 24. Twigs hairless, brownish; fruits dry pods. **ACACIAS ETC. PL. 19**  
 24. Twigs hairy, usually green; fruits fleshy. **JUJUBE PL. 27**
- E. SINGLE THORNS PRESENT, SOMETIMES WITH PAIRED THORNS:**  
 25. Trees with both paired and single thorns. 26  
 25. Trees with thorns only single, not paired. 27



26. Stubby spur branches obvious. **MESQUITES PL. 19**  
 26. Spur branches lacking. **SOUTHWESTERN CORALBEAN, ETC. PL. 18**
27. Twigs ending in sharp spines, no side thorns, desert trees. **ALLTHORN, ETC. PL. 26**
27. Thorns present laterally along twigs or branchlets. **28**  
 28. Thorns hooked. **29**  
 28. Thorns straight or only slightly curved. **30**
29. Spur branches absent, bundle scars 3, fruits small, dark, fleshy. **PRICKLY-ASHES PL. 18**
29. Spur branches common, bundle scar 1, fruits dry pea pods. **CATCLAWS PL. 20**
30. Thorns slender, bare, without buds. **31**  
 30. Thorns stubby, bearing buds. **34**
31. Trees of the arid Southwest. **GUAJILLO, PALOVERDES PL. 20**
31. Trees of more moist regions. **32**  
 32. Thorns under 1 in. long, sap milky (in warm weather). **OSAGE-ORANGE PL. 28**
32. Thorns 1–10 in. long, sap not milky. **33**
33. Thorns about 1 in. long, not forked. **HAWTHORNS PL. 27**
33. Thorns 2–10 in., often forked. **HONEY LOCUST PL. 20**
34. Trees of semi-humid areas. **CRABAPPLES, PLUMS, ETC. PL. 27**
34. Trees of the arid Southwest. **35**
35. Thorny twigs dense, alternating at right angles. **CONDALIAS, ETC. PL. 28**
35. Side twigs stiff, spiky, not alternating at right angles. **36**  
 36. Trunk short, peeling. **ELEPHANT-TREE, ETC. PL. 23**  
 36. Trunk otherwise. **DESERT APRICOT, ETC. PL. 27**

#### **D. TREES NOT THORNY:**

#### **F. BUDS CLUSTERED AT OR NEAR TWIG ENDS:**

37. Twigs with buds clustered at or near twig ends. **38**
37. Twigs without clustered end buds. **41**  
 38. Spur branches absent. **39**  
 38. Spur branches present. **40**
39. Buds scaly, species widespread. **OAKS PLS. 32–35**
39. Buds without scales, Pacific Northwest and n. Rockies. **CASCARA BUCKTHORN PL. 43**
40. Bundle scars 3, sap clear, n. U.S. **FIRE CHERRY PL. 42**
40. Bundle scar 1, sap milky (*poisonous!*), s. Tex. and sw. Ariz. areas. **TALLOWTREE PL. 31, JUMPING-BEAN SAPIUM PL. 39**

#### **F. END BUD NOT CLUSTERED:**

#### **G. BUDS ± ENCIRCLED BY O-, U-, OR V-SHAPED LEAF SCARS:**



- 41.** Buds encircled or nearly so by O-, U-, or V-shaped leaf scars. **42**
- 41.** Buds located above leaf scars. **44**
- 42.** Leaf scars with numerous bundle scars. **43**
- 42.** Leaf scars with 3 bundle scars (see also Honey Locust, thornless form, Pl. 20) **HOPTREES PLS. 22, 24; SOPHORAS PL. 24**
- 43.** Buds often woolly with several obscure scales; bundle scars mostly in 3 groups. **SUMACS PLS. 22-24**
- 43.** Buds not woolly, with only 1 caplike scale. **SYCAMORES PL. 29**

**G. BUDS LOCATED ABOVE LEAF SCARS:**

**H. LEAF SCARS DEEP, EITHER TRIANGULAR OR SHIELD-SHAPED:**

- 44.** Leaf scars deep, either triangular or shield-shaped; twigs often stout, relatively inflexible; bundle scars 4 or more, sometimes in 3 groups (bundle scars 3 in Western Soapberry). **45**
- 44.** Leaf scars shallow, twigs mostly slender, bundle scars various. **50**
- 45.** Pith chambered, buds woolly. **WALNUTS PL. 21**
- 45.** Pith continuous, buds various. **46**
- 46.** Buds longer than wide, end bud larger. **HICKORIES PL. 21**
- 46.** Buds small, globular; end bud various. **47**
- 47.** Leaf scars deeply triangular; bundle scars not grouped; fruits papery, winged, clustered. **TREE-OF-HEAVEN PL. 21**
- 47.** Leaf scars 3-lobed, bundle scars in 3 groups, fruits neither papery nor winged. **48**
- 48.** Plants with several stems; fruits dry, pear-shaped capsules,  $1\frac{1}{2}$ –2 in. across. **MEXICAN-BUCKEYE PL. 22**
- 48.** Trees with a single trunk; fruits  $1\frac{1}{2}$ -in. smooth balls. **49**
- 49.** Twigs greenish gray; buds 2-scaled, hairless, and often several at each leaf scar, above one another; fruits not always present. **WESTERN SOAPBERRY PL. 24**
- 49.** Twigs dark brown, buds single, hairy; fruits usually persistent. **CHINABERRY PL. 25**

**H. LEAF SCARS SHALLOW, TWIGS MOSTLY SLENDER:**

- 50.** Buds without scales. **BUCKTHORNS PL. 43**
- 50.** Buds with scales. **51**
- 51.** Bud scale 1, mostly smooth, caplike. **WILLOWS PLS. 36-38**
- 51.** Bud scales more than 1. **52**
- 52.** Pith chambered or at least partitioned at the leaf scars. **53**
- 52.** Pith solid, continuous. **56**



**I. PITH CHAMBERED OR AT LEAST PARTITIONED:**

53. Twigs encircled by narrow lines (stipule scars); buds 2-scaled, spicy when crushed. **TULIPTREE PL. 29**

53. Twigs and buds otherwise (see also Walnuts Pl. 21). **54**

54. Bundle scars 5, twigs rough-hairy, trunk not warty.

**PAPER-MULBERRY PL. 29**

54. Bundle scars 3. **55**

55. Trunk warty; twigs hairy or not, twigs/buds brownish.

**HACKBERRIES PL. 30**

55. Trunk not warty; twigs hairless, purplish; buds green.

**INDIAN-PLUM PL. 40**

**I. PITH SOLID, CONTINUOUS:**

56. Buds with a narrow base (stalked), blunt, reddish when mature, 2-scaled; small, woody, conelike catkins usually pres-ent.

**ALDERS PL. 40**

56. Buds not stalked. **57**

57. Inner bark of small branches can be peeled in fibrous strips when cut. **58**

57. Cut inner bark weak, not especially fibrous. **60**

**J. INNER BARK OF SMALL BRANCHES PEELS IN FIBROUS STRIPS WHEN CUT:**

58. Bundle scars 3; buds brown, scale edges often darker.

**ELMS PL. 41**

58. Bundle scars more than 3. **59**

59. Bud scales 4-6, brownish; sap milky (in warm weather).

**MULBERRIES PL. 29**

59. Bud scales 2-3, red or green; sap clear.

**BASSWOODS PL. 30**

**J. INNER BARK WEAK, NOT FIBROUS WHEN CUT:**

60. Twigs green, bundle scar 1 or indistinct. **61**

60. Twigs not green, bundle scars various. **62**

61. Twigs 4-lined or 4-angled; trunk mottled. **CRAPEMYRTLE PL. 17**

61. Twigs smooth, trunk gray-green.

**CHINESE PARASOLTREE PL. 29**

62. Spur branches present (See also Poplars 72). **63**

62. Spur branches lacking. **70**

**K. SPUR BRANCHES PRESENT:**

63. Trunk marked with horizontal streaks (lenticels), bundle scars 3. **64**

63. Trunk bark without horizontal lines; bundle scars various. **65**

64. Buds with 2-3 scales, broken twigs without an almond odor.

**BIRCHES PL. 41**

64. Buds with 4-6 scales, broken twigs often with an almond odor.

**PEACH PL. 39; CHERRIES PL. 42**





## APPENDIX B

### PLANT RELATIONSHIPS

Field identification does not require a knowledge of major classification groups or even of family or scientific names. Yet it is often desirable to know general relationships within the plant kingdom. The following list indicates the family relationships of the genera of trees within our area. The listing of conifers (Division Pinophyta) is based on the work of Cronquist, Takhtajan, and Zimmermann (1966). That of the broad-leaved plants (Division Magnoliophyta) is the judgment of Cronquist (1981). Dr. Arthur Cronquist is late senior scientist at the New York Botanical Garden. All major and many minor botanical subdivisions are based on flower and fruit structures. Family names tend to be standardized by the ending *-aceae*, orders by *-ales*, subclasses by *-idae*, classes by *-opsida*, and divisions by *-ophyta*.

KINGDOM PLANTAE  
SUBKINGDOM EMBRYOBIONTA  
DIVISION PINOPHYTA  
CLASS PINOPSIDA  
SUBCLASS PINIDAE

**Order Taxales**

Family Taxaceae: *Taxus*, *Torreya*

**Order Pinales**

Family Pinaceae: *Abies*, *Cedrus*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga*,  
*Tsuga*

Family Taxodiaceae: *Metasequoia*, *Sequoia*, *Sequoiadendron*, *Taxodium*

Family Cupressaceae: *Calocedrus*, *Chamaecyparis*, *Cupressus*,  
*Juniperus*, *Thuja*



**DIVISION MAGNOLIOPHYTA**

**CLASS MAGNOLIOPSIDA**

**SUBCLASS MAGNOLIIDAE**

**Order Magnoliales**

Family Magnoliaceae: *Liriodendron*

**Order Laurales**

Family Lauraceae: *Cinnamomum*, *Persea*, *Umbellularia*

**SUBCLASS HAMAMELIDAE**

**Order Hamamelidales**

Family Platanaceae: *Platanus*

Family Hamamelidaceae: *Liquidambar*

**Order Urticales**

Family Ulmaceae: *Celtis*, *Ulmus*

Family Moraceae: *Broussonetia*, *Maclura*, *Morus*

**Order Juglandales**

Family Juglandaceae: *Carya*, *Juglans*

**Order Myricales**

Family Myricaceae: *Myrica*

**Order Fagales**

Family Fagaceae: *Castanea*, *Chrysolepis*, *Fagus*, *Lithocarpus*,  
*Quercus*

Family Betulaceae: *Alnus*, *Betula*, *Corylus*, *Ostrya*

**Order Casuarinales**

Family Casuarinaceae: *Casuarina*

**SUBCLASS CARYOPHYLLIDAE**

**Order Caryophyllales**

Family Nyctaginaceae: *Pisonia*

Family Cactaceae: *Cereus*, *Opuntia*

**SUBCLASS DILLENIIDAE**

**Order Malvales**

Family Tiliaceae: *Tilia*

Family Sterculiaceae: *Firmiana*, *Fremontodendron*

**Order Violales**

Family Tamaricaceae: *Tamarix*



**Order Salicales**

Family Salicaceae: *Populus*, *Salix*

**Order Capparales**

Family Capparaceae: *Koeberlinia*

**Order Ericales**

Family Ericaceae: *Arbutus*, *Arctostaphylos*, *Rhododendron*, *Vaccinium*

**Order Ebenales**

Family Sapotaceae: *Bumelia*

Family Ebenaceae: *Diospyros*

**SUBCLASS ROSIDAE****Order Rosales**

Family Rosaceae: *Adenostoma*, *Amelanchier*, *Cercocarpus*, *Cowania*, *Crataegus*, *Heteromeles*, *Lyonothamnus*, *Malus*, *Oemleria*, *Prunus*, *Pyrus*, *Sorbus*, *Vauquelinia*

**Order Fabales**

Family Mimosaceae: *Acacia*, *Leucaena*, *Lysiloma*, *Pithecellobium*, *Prosopis*

Family Caesalpiniaaceae: *Caesalpinia*, *Cercidium*, *Cercis*, *Gleditsia*, *Parkinsonia*

Family Fabaceae: *Dalea*, *Erythrina*, *Eysenhardtia*, *Olneya*, *Robinia*, *Sophora*

**Order Proteales**

Family Eleagnaceae: *Elaeagnus*, *Shepherdia*

Family Proteaceae: *Grevillea*

**Order Myrtales**

Family Lythraceae: *Lagerstroemia*

Family Myrtaceae: *Eucalyptus*

**Order Cornales**

Family Cornaceae: *Cornus*, *Garrya*

**Order Celastrales**

Family Celastraceae: *Canotia*, *Euonymus*

Family Aquifoliaceae: *Ilex*

**Order Euphorbiales**

Family Euphorbiaceae: *Sapium*





## GLOSSARY

See also Fig 1. Leaf and Twig Terminology, p. 3; Fig. 2. Leaf Shapes, p. 4; and Fig. 3. Twig and Bud Terminology, p. 6.

**Alternate (leaves, buds).** Not opposite but arranged singly at intervals along twigs.

**Angled (twig, bud).** Having evident ridges; not smoothly rounded.

**Aromatic.** Having a distinctive odor, at least when crushed.

**Base (leaf).** The lower portion, toward the leafstalk.

**Berry (fruit).** Strictly speaking, a fleshy fruit that contains small seeds (such as a grape). The mention of "berry" or berrylike fruits indicates fleshy fruits that are not true berries.

**Blade (leaf).** The broad, expanded portion.

**Bloom (twig, leaf, fruit, etc.).** A whitish powdery coating.

**Bract.** A somewhat leaflike, petallike, or woody structure occurring beneath a flower or fruit or their clusters.

**Branchlet.** Except for the twig, the youngest and smallest division of a branch. See **Twig**.

**Bristle.** A stiff hair, sometimes pricklike.

**Bundle scars.** Tiny dots or lines within the leaf scar, caused by the breaking of bundles of ducts leading into the leafstalk. Sometimes elongate or curved.

**Capsule.** A dry fruit that splits partly open at maturity.

**Catkin.** A cluster of tiny flowers or fruits, usually fuzzy and caterpillar-shaped, often drooping. It occurs in oaks and in willows and their relatives. Where there are flowers of only one sex, male catkins usually are larger.

**Chambered (pith).** Pith divided crosswise by numerous plates or membranes. Term is here used broadly to include all types of segmented and transversely divided pith (diaphragmed, partitioned). When the twig is cut lengthwise, such a pith looks ladderlike. See **Partitioned**.

**Coarse-toothed (leaf edge).** With large teeth; dentate, serrate.



rounding the reproductive organs and lying outside the petals; usually green.

**Sheath (conifer needle).** Thin tissues present at needle bases and binding the needle bundles.

**Short-pointed (leaf tip).** Abruptly constricted and sharply pointed; not gradually tapering.

**Short shoot (branchlet).** See **Spur branch**.

**Shreddy (bark).** Dividing into fragile, thin, narrow sheets.

**Shrub.** A woody plant usually growing with several strong stems and less than about 13 feet maximum height.

**Side buds.** Buds in a lateral, not end, position.

**Simple leaf.** Composed of only a single blade, though frequently lobed.

**Single-toothed (leaf edge).** Bearing only a single set of teeth. See **Double-toothed**.

**Sinus (leaf).** The space between 2 leaf lobes.

**Solid (pith).** See **Continuous**.

**Spathe.** A large membranous bract or pair of bracts that encloses a flower cluster.

**Species.** For practical purposes: populations whose individuals freely breed with one another and vary only slightly from one another.

**Spicy-scented.** Aromatic, with a spicy odor.

**Spike (flower, fruits).** A cluster with a narrow, fingerlike shape, the individual flowers or fruits with short stalks or none.

**Spine.** See **Thorn**.

**Spur branch.** A stubby branchlet with densely crowded leaves and leaf scars. Often bearing flowers, fruits. See Fig. 3, p. 6. Synonymous with **Short shoot**.

**Stalked (buds).** Having a narrow necklike base.

**Sterile (flower).** Infertile, unproductive.

**Stipule.** A leafy growth at the base of the leafstalk, usually small and in pairs, leaving scars on the twig when it drops. See also **Ringed**.

**Straggling.** Semi-upright.

**Terminal (bud, flower/fruit cluster).** Growing at the end of the twig. See **End bud (twig)**.

**Thorn (twig, branchlet, branch, stem).** A stout, sharp, woody outgrowth of the stem. Technically, prickles and spines are of different origin, but this book does not require a distinction to be made.

**Thrice-compound (leaf).** Divided into major leaflets that in turn are divided into minor leaflets, which are further subdivided into subleaflets; an uncommon type.

**Tip (leaf).** The apex.

**Tree.** A woody plant with a single main stem at least 3 inches in



diameter at breast height (4½ feet) and growing more than 13 feet tall.

**Trunk.** The main stem of a tree.

**Tubular (flower).** With the basal portion hollow and tubelike.

**Tundra.** Vegetation type of very cold climates, especially in Far North, overlying permafrost and consisting of lichens, sedges, mosses, grasses, and low woody plants.

**Twice-compound (leaf).** With the major leaflets further divided into minor leaflets.

**Twig.** The end subdivision of a branch; the current year's growth.

**Variety.** That portion of a species which in a certain geographic area differs slightly from the remainder of the species elsewhere.

**Wavy-edged (leaf edge).** With flat, shallow, rounded undulations. See **Crinkled**.

**Wavy-toothed (leaf edge).** Wavy-edged but with more toothlike projections; crenate.

**Wedge-shaped (leaves, leaf bases, leaf tips).** With narrow, tapering bases or, less often, tips; cuneate, acute.

**Whorled (leaves, leaf scars).** Arranged in circles around the twigs.

**Winged (leafstalk, twig).** With projecting thin flat membranes or corky outgrowths.

**Woody plant.** With the stems and limbs containing lignin (wood).





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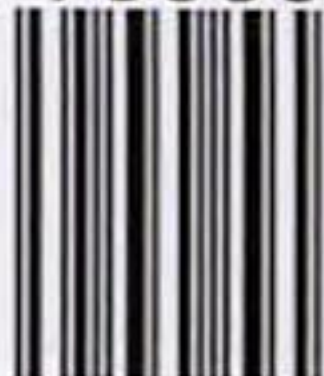
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